APRIL 1959

POWER PLANT & POWER SERVICES INDUSTRY

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- new solutions
- new literature

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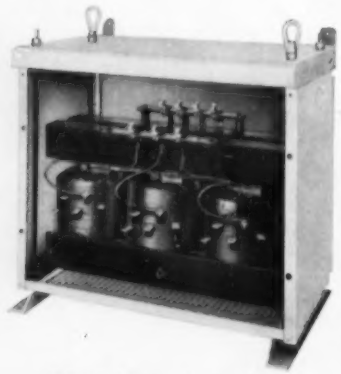

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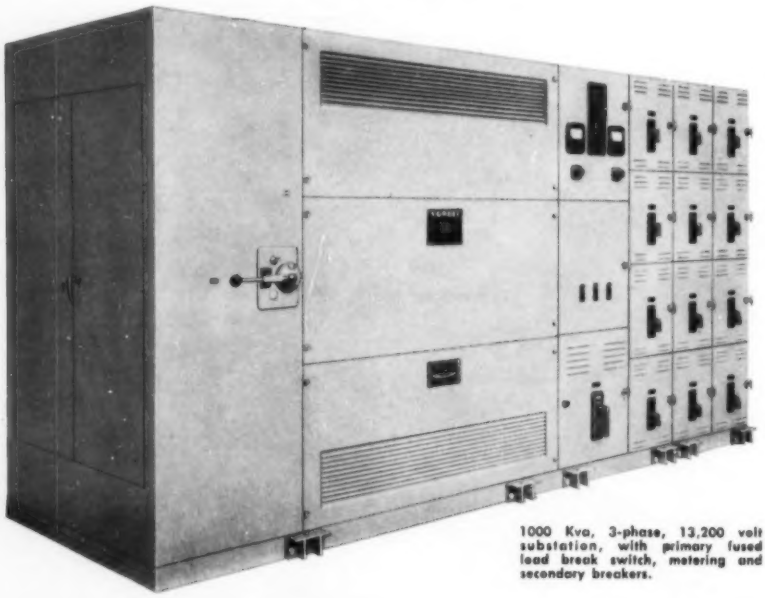

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Apr. 1-2: 21st American Power Conference; Hotel Sherman, Chicago, Ill.

Apr. 5-9: Edison Electric Institute Annual Convention; New Orleans, La.

Apr. 5-10: 1959 Nuclear Congress; Public Auditorium, Cleveland, Ohio.

Apr. 6-10: 1959 Welding Show, 40th Annual Convention; Hotel Sherman and International Amphitheatre, Chicago, Ill.

Apr. 14-15: AIEE Material Handling Conference; Pfister Hotel, Milwaukee, Wis.

Apr. 19-23: ASME Oil and Gas Power Division Conference; Shamrock-Hilton Hotel, Houston, Texas.

Apr. 29-May 4: Oil-Heat Institute of America, Inc.; Seattle, Wash.

May 3-6: Air-Conditioning and Refrigeration Institute, Board and Annual Meeting; The Homestead, Hot Springs, Va.

May 11-13: Second Annual Power Conference of Instrument Society of America; President Hotel, Kansas City, Mo.

May 17-20: Industrial Heating Equipment Association, Inc.; The Homestead, Hot Springs, Va.

May 25-28: Design Engineering Show; Convention Hall, Philadelphia, Pa.

May 25-28: Design Engineering Conference; Convention Hall, Philadelphia, Pa.

May 30-June 5: Fifth World Petroleum Congress; New York.

June 7-11: American Society of Heating and Air-Conditioning Engineers, Inc., Semi-Annual Meeting; Vancouver, B.C.

June 17-20: 1959 Engineering Progress Exposition; Hotel Commodore, New York, N. Y.

June 22-24: American Society of Refrigerating Engineers, Annual Meeting; Lake Placid Club, Lake Placid, N. Y.

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April 1959
VOL. 75 No. 4

POWER PLANT & POWER SERVICES INDUSTRY

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POWER INDUSTRY

. . . with which are combined INDUSTRIAL POWER and INDUSTRY POWER . . . serves the key men responsible for plant and power services throughout all industry, including utilities, and also in complexes of public institutions, schools, hospitals, etc.

The function of these plant and power services is to create and maintain the environment and provide the facilities necessary to effective operation of these industries and/or buildings, regardless of variety of products manufactured or uses of buildings.

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NBP NATIONAL BUSINESS PUBLICATIONS, INC.

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Acme Steel Company's new $25-million steelmaking plant is nearing completion. POWER INDUSTRY asked company engineers why they chose aluminum as the major conductor

10 **The present and future in industrial lighting**

When asked "What's happening in industrial lighting" GE's E. A. Linsday came back with some very important answers

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Whirlpool's Helmut Bohn has draperies in his boiler room. Story tells how his boilers operate at top efficiency and cleanliness

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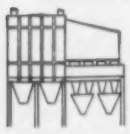

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REPORTS IN BRIEF

Can we maintain energy supremacy

Working under the concept that the U.S. must maintain "energy supremacy" if it is to keep its position of world leadership, domestic oil producers have introduced an "industrial manifesto." They urge cooperation by all energy resource industries in interpreting their problems to the public and to the government.

In a press conference, the Independent Petroleum Association of America set forth what it termed problems facing all "mineral fuel and power resource industries" in meeting growing U.S. energy demands which are expected to increase by one-third in the next decade.

The extent of energy availability will be influenced increasingly by the extent of scientific and technical improvements, economic considerations, and government policies and laws.

Meeting growing demands—including an expected 43 percent hike in petroleum consumption in the next 10 years—will "require stability in economic conditions and consistency in government policies and actions."

Petroleum fuel, oil and natural gas, are supplying an increasing share of the needs. By 1968, it is estimated, petroleum will be filling 73 percent of domestic energy requirements. To meet the growing demand the domestic petroleum industry "will be required to conduct an expanding exploratory and drilling program involving investment of at least $75 billions."

The influence of economic conditions and government policies on future availability of energy, requires that the energy resource industries cooperate in their efforts "to properly interpret to the public the problems, policies, character and relationships with government of the essential energy industries."

The energy industries, petroleum, uranium, coal, water power and electrical generating industries "share similar and many identical problems in their relationships with government and with the public," said IPAA.

"Above all else," it added, "these vital industries share the increasing responsibility of maintaining the national strength as to indispensable supplies of energy."

The so-called conventional fuels will continue to provide the great bulk of long-range energy requirements. So far this country has been and is fortunate to have available adequate energy resources to meet its requirements in times of emergency.

New theory explains thermocouple

A better way of analyzing metals and a better thermocouple may result from findings by two Michigan State University physicists.

Dr. Frank Blatt, associate professor, and Richard Kropschot, graduate student, have experimental evidence for a relatively new theory about the workings of thermocouples.

The first explanation for the thermoelectric phenomenon was that electrons flowed from the warm end to the cool end in much the same manner that air from a warm room will tend to flow into a cold room.

More recently, an additional mechanism was suggested. According to this theory, the nearly infinitesimal movements of atoms within the wire also help to accelerate the flow of electrons.

Dr. Blatt and Kropschot reasoned that if the newer theory were true, the thermoelectric action would be affected by the mass of the impurity atoms in the wire.

They conducted experiments with metals containing many impurities. By their reasoning, some of the impurities would prevent the additional mechanism from taking place.

As they had predicted, their data showed that only the first mechanism was taking place when they used wires with certain impurities added. When they removed the impurities, their data showed that both mechanisms were taking place.

They believe there is a good possibility that their laboratory technique could be used in reverse by industry. That is, by measuring the thermoelectric properties of unknown metals, the amount and nature of the impurities could be obtained.

This, Dr. Blatt pointed out, would have some advantage over spectrographic and chemical analysis, in which a part of the specimen being analyzed must be destroyed.

Man-made rubber — improvement on nature

A unique man-made rubber, added to a batch of tree rubber, improves the natural product so that it holds air as well as the best synthetic rubber.

The rubber, known chemically as brominated butyl, was described recently in a progress report by Richard T. Morrissey, scientist at The B. F. Goodrich Research Center. He is also the discoverer of the substance.

The rubber can be used to fortify tree rubber against ozone damage. This has been a major project of scientists for more than a generation.

The rubber also acts as a base for an adhesive which permits bonding of butyl rubber to metals or other rubbers.

Who's myopic?

A group of engineers were told that they are frequently not considered for management positions because their view of industrial operation is frequently too narrow; but presumably were cheered by broad hints that other professions are similarly myopic.

V. Donald Schoeller, in a paper prepared for an afternoon session of the annual meeting of The American Society of Mechanical Engineers, commented on the question, "Why are more engineers not considered for administrative positions?"

After pointing out that industrial administration requires a broad outlook, examples of deficiencies in this skill involved not only engineers, but accountants, marketing experts, labor relations men, purchasing personnel and others.

The relation of marketing practices to the automobile industry came in for comment in these words: "Actually, as we all know, our present automobiles are less safe than models of a decade ago. With the tremendous expanse of glass and the lack of support pillars, we may as well all buy soft-top convertibles, from the safety point of view.

"When the first wrap-around windshield came out (at the demand of the marketing department) one assembly plant found that it had to add 18 production stations to the assembly line, therefore adding substantially to labor costs and material costs of the automobile."

He continued under the heading of manpower: "If the manpower, industrial relations, labor relations, public relations area becomes overly dominant, we will drive farther and farther into the colossal labor cost give-away program that has created the present wage-push inflation situation in American industry.

"This is a serious challenge to our entire economy. This becomes an especially ludicrous situation when senior pilots on jet aircraft ask $45,000 per year for flying 85 hours per month and railroad engineers between Philadelphia and New York City receive 2 days pay for a 3 hour round trip."

As for engineers, the author reserved a fairly mild criticism of work too well done, citing the over-zealous engineers who "have designed such things as continuous automatic glass-blowing machines for electric-light closures with such a high capacity that an entire year's production could be turned out in 3 months."

The after-the-fact consideration by the marketing division disclosed that the total market could not be expanded sufficiently to keep the tremendous machine busy.

Electricity from gold

The General Electric Atomic Power Equipment Department announced completion of an eight-day experiment in which electricity was directly produced from a radioisotope using a thermionic converter under gamma radiation conditions.

The experiment was conducted at the Vallecitos Atomic Laboratory, using gold as the radioactive source material.

This follows closely the disclosure by the AEC of the development of a small atomic generator which uses polonium as its radioisotope and thermoelectric energy conversion device.

The thermionic converter demonstration was designed primarily for space vehicle auxiliary electric power applications.

The demonstration had indicated that their system had the potential to produce an extremely high ratio of power to weight.

A power pack, generating more than 100 watts of elec-

NEW SAFETY TREAD

Super-Stairmaster is the new heavy duty aluminum safety stair tread that repairs and modernizes worn or slippery stairs now available from Wooster Products Inc., Wooster, Ohio.

The new abrasive "TRAFFIC-FLOW" design of the Super-Stairmaster has a magnetic-like grip which provides safe, sure traction on commercial—industrial—institutional stairs and is 100% effective under dangerous wet or oily conditions. Perfect safety for ladies' high heels is a feature of interest to managers of buildings open to the public. The treads are rugged and outwear concrete, stone or marble. Easily applied over all types of stairs. Cleans with once-over-sweeping or vacuum.

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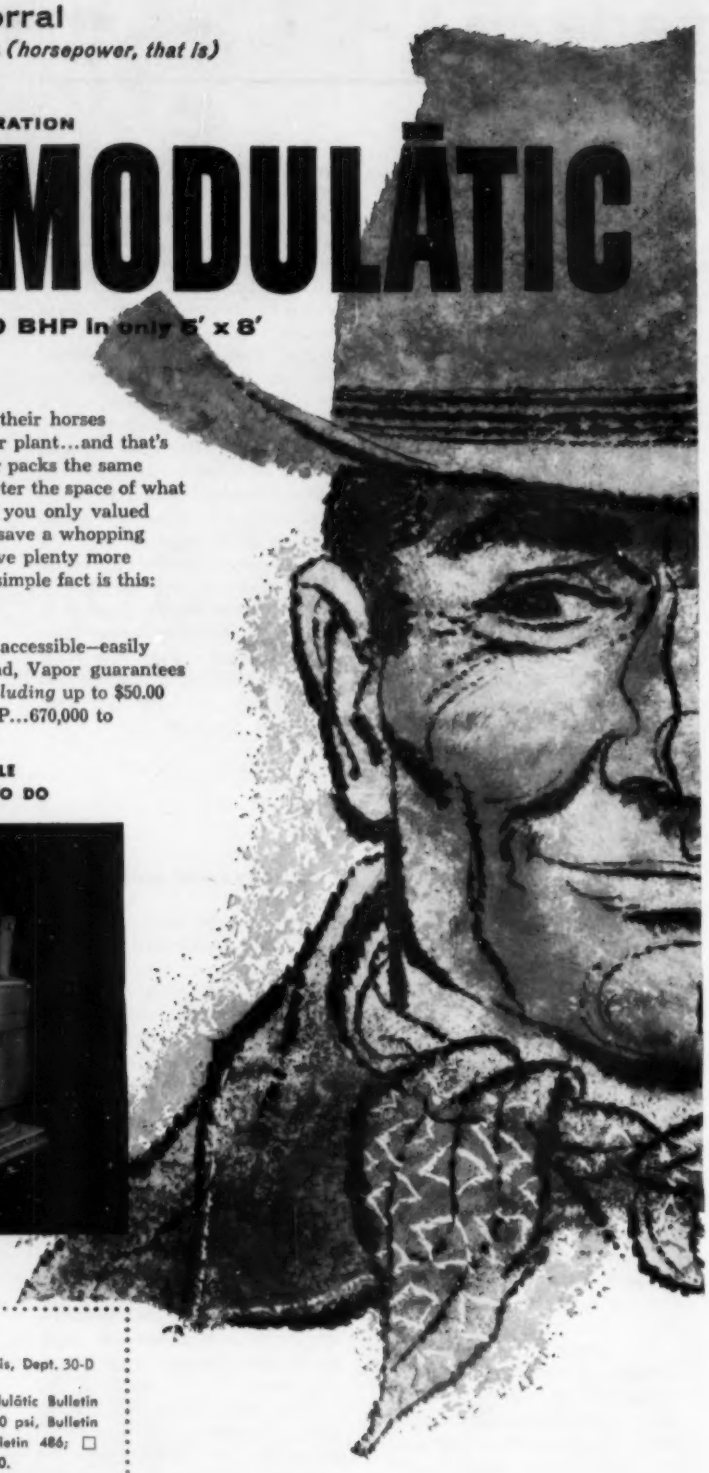

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REPORTS IN BRIEF

tricity and lasting more than year, could weigh less than 25 pounds.

This experiment has shown the ability of the thermionic converter to operate successfully under actual operating conditions of a space vehicle — including a vacuum, high temperatures, and the gamma radiation which would be encountered with the use of some long-lived radioisotope such as cerium 144.

The device operated at temperatures up to 1700°F on the hot side and 800°F on the cool side.

Atomic energy report

The Atomic Industrial Forum, Inc., announced the publication of a report, *The Impact of the Peaceful Uses of Atomic Energy on State and Local Government*, based on a conference sponsored by the Forum.

The 92-page document was prepared by the Forum staff based on the remarks presented and discussion which followed at the conference.

Highlighted in the report are the effects which atomic energy development will have upon state and local agencies and the decisions which their officials will be called upon to make regarding peaceful uses of the atom.

Coordination, cooperation and communication between all levels of government, Federal, state and local, and with the atomic industry "have been sought and obtained to a reasonable degree."

The report adds that the public at large still requires additional, factual information on atomic energy and radiation hazards generally.

Chapters in the report cover trends in atomic technology and in state government, national codes and standards, state and local regulatory agencies, state and local industrial development programs, the state legislators' problems, state-level coordination of atomic energy and related national programs.

Removal of sludge

Poor combustion and excessive sooting, caused by sludge buildup on fuel oil burner nozzles are being overcome by addition of a Du Pont chemical to the fuel oil.

A large industrial power plant using heavy (No. 6) fuel oil, Du Pont petroleum technicians found that addition of one pint of the fuel oil additive (FOA-2) to each 1000 gallons of fuel oil, cleared up nozzle foulings and caused burner flame patterns to return to normal. After the additive was used, soot and odor complaints dropped sharply.

Sludge in the storage tank at this plant's powerhouse was also a problem. The tank had to be cleaned periodically. Two months after using FOA-2 the tank was drained to repair a leaking steam coil and inspection showed that although the tank had not been cleaned for a year, it was as clean as a gasoline tank. The accumulated sludge had been dispersed through the oil to permit burning with no nozzle fouling.

Evolution of electricity

"Power and Progress," an illustrated booklet just published by the Edison Electric Institute, tells the role the electric industry plays in the nation's progress and describes the opportunities in the industry's future.

Electrical living in the year 2000 starts the book. Also it describes the birth of the industry with Edison's development of the incandescent electric light and the first large-scale electricity supply system.

It relates the industry's early struggles in gaining acceptance for electricity and its applications, and how the US attained world leadership in electric power.

Description in non-technical terms tells how the energy in a lump of coal, in falling water and in the heart of the atom is transformed into electricity, and how electricity travels the networks of power lines to meet customer needs. It also presents the price record, with a discussion of the reasons why the average price of residential electricity is now less than half of what it was 25 years ago, while the cost of living has more than doubled during the same period.

Career opportunities in the industry, contributions electric companies make to community progress, and human benefits based on electricity now and in the future are also discussed.

The highs and lows of creativity

The scientific world will reach a peak of creativity in 15-years. But a new Dark Age can follow within a century.

These predictions come from a University of Michigan social scientist interested in historical cycles of creativity. He is S. Stewart West (PhD), study director of U-M Survey Research Center.

Figures on scientific activity dating back as far as 600 B.C. show that peaks of creativity have occurred about once every 164 years. A similar interval separates low points in creativity.

The next crest should be due in 1973 — give or take a few years. The next low a "major minimum" — around the year 2055 A.D.

He supplements historical data with the following: A statistical analysis of membership trends in the American Physical Society, which indicates its fastest growth will come just a few years after 1973; observation that the year 1980 will approximate the end of creative life for those persons whose scientific training was completed by about 1940 — when team research began to be important; and population forecasts for 20 Western nations, which indicate a new period of stability in the mid-21st Century.

The U-M researcher doubts that knowledge of "creativity cycles" will enable man to avoid an eventual decline in scientific achievement.

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These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants, in modernization, and for power distribution in all types of manufacturing processes. A new catalog, just off the press, gives full information and installation techniques. Ask for your FREE copy today.

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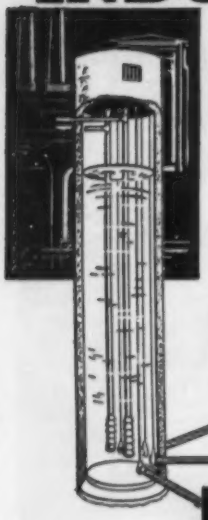
INDUSTRIAL water... a job for the RANNEY METHOD



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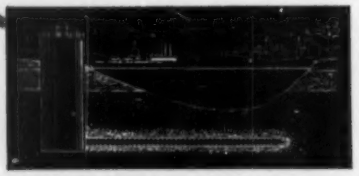

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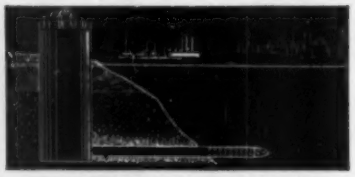

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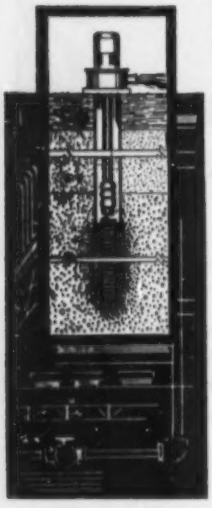

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LETTERS

Your views are welcome in this column. Address "Letters, Power Industry, 111 East Delaware Place, Chicago 11, Ill." Letters should be brief and confined to the editorial of this magazine or other topics of interest to the power services field.

Wrong maker —

Thank you for the excellent description given of the Von Arx Gun in the "New Developments" section of the February issue.

In the description, it was stated that Swissair Tool Corporation is the manufacturer of the Von Arx Air Gun. This statement is erroneous as Swissair acts only in the capacity of distributor.

P. J. VOMVOURAS
The Mar-Indus Company

Likes articles

Please advise on 500 copies of "To Lease — or not to Lease." This article was contained in the February 1959 issue of POWER INDUSTRY.

A. O. SWENSEN, MANAGER
Preferred Utilities Manufacturing Corp.

We should like to compliment you on the featured article in the January issue entitled "We are being Misled on Nuclear Power" by Dr. Robert E. Wilson.

After reading so many highly imaginative articles inferring that we are on the verge of having nuclear power available for everything from central station power generation to cooking eggs at practically no cost, it is indeed refreshing to come across such a sane analysis of the situation.

If they are available, we should like fifty copies of reprints of this article.

M. J. CHURCHILL
Detroit Stoker Company

"Did it ever occur to you to plug up the leak?"

Drive out
FOUL AIR
Blow in
FRESH AIR
with Coppus Type A Ventilator

Assure greater safety, comfort for workers... get greater efficiency.

Drive out dangerous fumes, gases, stagnant or hot air from boilers, cable manholes, tanks, vats and other confined places. *Supply fresh air continuously.*

Send now for further information. Coppus Engineering Corporation, 184 Park Avenue, Worcester 2, Mass.

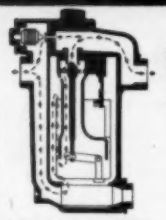
MANHOLES made safe for workers' entrance within minutes.

BOILER AND TANK INTERIORS cooled by Coppus. Fresh air supplied continuously.

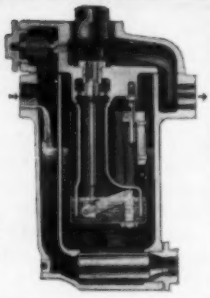
ANOTHER COPPUS "BLUE RIBBON" PRODUCT

Circle 9663 inside back cover.

Now—A Steam Trap that Adjusts Automatically to Every Operating Condition!



Warm-up speeded by discharge through by-pass as well as main orifice.



In-line installation. All parts serviced without removing body from line.

AUTOMATICALLY REGULATES FOR FASTER WARM-UP AND TO KEEP OPERATING TEMPERATURE AT PEAK HEAT

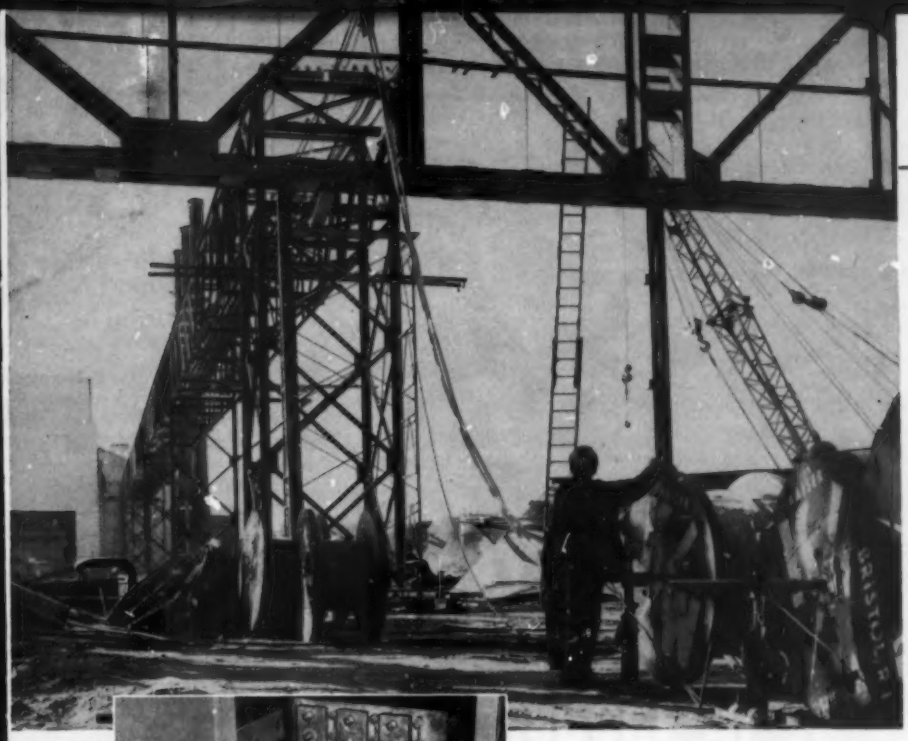
Proven bucket design with built-in accessories. By-pass thermostat increases discharge for warm-up and overload conditions. Thermostat compensated to operate at 10° below saturated steam temp. Wright-Austin Airxpel principle provides for mechanical discharge of air after Thermostatic by-pass has closed.

WRITE FOR BULLETIN 808

WRIGHT-AUSTIN COMPANY
3245 WIGHT STREET • DETROIT 7, MICH.

Circle 9664 inside back cover.

APRIL 1959
VOL. 75 NO. 4
POWER PLANT & POWER SERVICES INDUSTRY



Acme Steel Company's new steelmaking plant . . .

Will use over 75,000 ft of Aluminum Cable

GEORGE V. MICHAEL, Managing Editor
with **W. H. FULWIDER,** Electrical Superintendent
Acme Steel Company, Riverdale, Ill.
and **FELIX KOZLOWSKI,** Superintendent
Hatfield Electrical Co., Chicago, Ill.

A

B

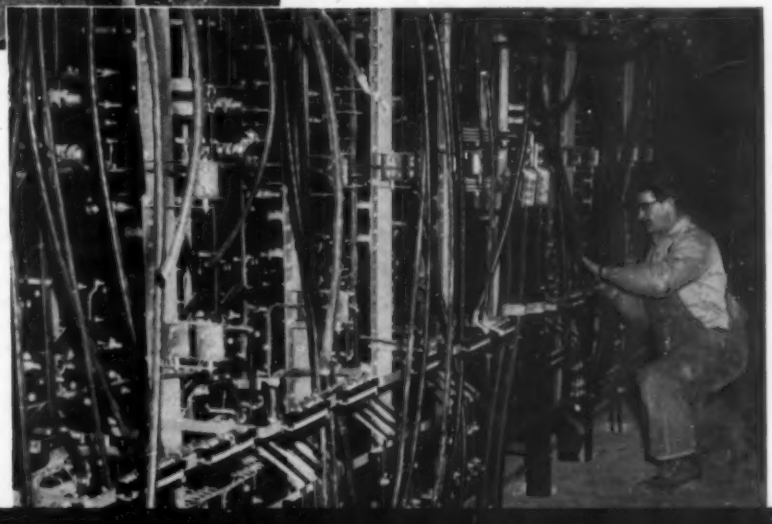
A) The comparatively lighter weight of aluminum conductors accounts for easier installation. Here at Acme Steel Company's new plant six cables of 1600 MCM stranded aluminum weather-proof wire and six cables of 750 MCM stranded weather-proof wire are being installed. Cables are used as 250v DC and 440 three-phase AC tie-lines between substations

B) and C) Close-up view of compression connectors. Bottom photo shows power cable connection from a 250v DC generator. Top photo shows cable termination on DC switchgear

D) All power wire to this 250v DC auxiliary motor control panel in the Blooming Mill is aluminum. All connections are made to copper with compression-type aluminum connectors

C

D



WHAT will be a major industrial installation of aluminum cable is now undergoing completion at Acme Steel Company's new plant in Riverdale, Ill. The $25 million steelmaking plant, consisting of primary melt shop and rolling mills, will eventually use a total of 75,000 ft of aluminum conductors.

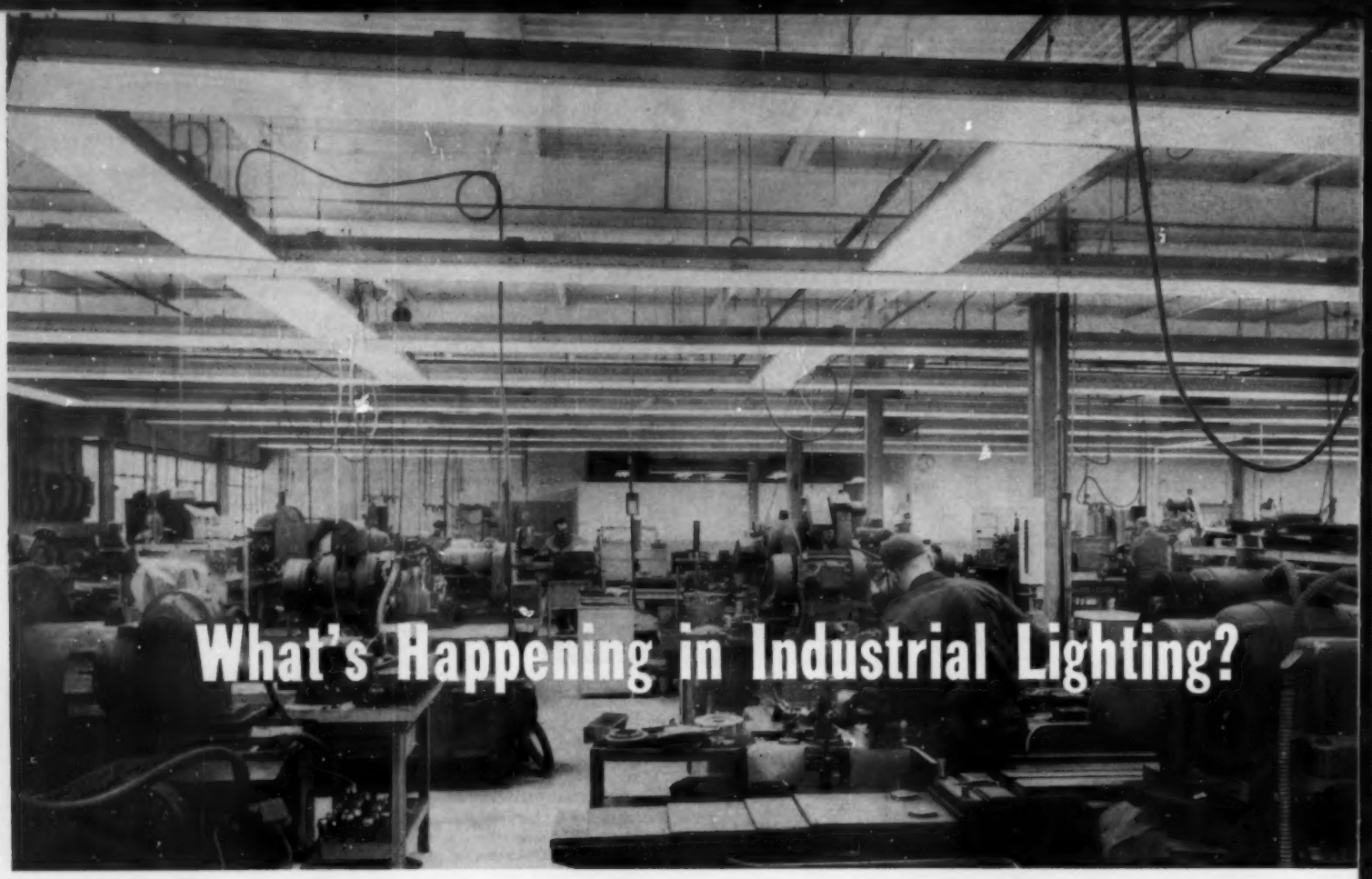
The plant will have an ultimate load of 10,000 kw. One million dollars will be spent on switchgear alone.

The decision to use aluminum cable in this highly electrified plant was based on two major reasons. First of all, there are savings to be realized in original price and installation. Of all known metals, aluminum has the highest electrical conductivity based on equivalent weight.

Equal lengths of covered aluminum cable with same current-carrying capacity weigh about 50% that of copper.

In handling, this lighter weight also accounts for savings—in shipment, intra-plant handling, and pulling. This is especially true when it comes to handling very large reels of cable. In pulling, the job is made a lot easier by the light-

To page 33



What's Happening in Industrial Lighting?

An Interview with E. A. LINSDAY, Supervisor Industrial Lighting, Large Lamp Dept., General Electric Co.

Answer: The industrial lighting field is particularly active these days. A definite, established trend promises to raise lighting to a degree of usefulness within the next several decades that was not only unheard of but also economically impossible to achieve as recently as five years ago.

Several factors contribute to this trend: First, we have new lighting tool and application techniques — vastly improved maintenance of mercury lamps, and the practicability of operating lighting systems on high frequency.

Second, modern lighting installations generally use 100's of footcandles — an important transition requiring a reorientation of thinking from increments of 10's of footcandles. Until recently, doubling the light in a factory meant increasing it by 20 or 30 footcandles. Today this would require 100 to 200 footcandles in a modern plant.

Third, and probably the most significant, industry as a whole is rapidly accepting light — or, more properly, the seeing which results from light — as a production tool. Industrial lighting is regarded as a tool that can increase worker productivity, reduce profit-killing scrapped work, and make heavy contributions toward raising worker morale.

Q: Until now what has been the trend in industrial lighting?

A: Historically, general lighting recommendations have just about doubled every 10 years since 1898. This year the average recommended level is roughly 100 footcandles. If this pattern continues, it is reasonable to expect that the typical or average recommended lighting level would be approximately 2000 in the year 1998. There are many indications that this rate of progress may be accelerated in the future.

Q: You have been discussing recommended levels. What about the average lighting in industry today?

A: Unfortunately the average level lags behind the recommendations by 10 to 20 years. This means 1938 to 1948 lighting in the average industrial plant with a footcandle level of something like 35 footcandles.

Q: Who determines or establishes the standards or the recommended lighting levels?

A: Our group here at Nela Park does a lot to encourage better seeing for industry. But the currently recommended standards are prepared by the Illuminating Engineering Society (IES) and presented to the American Standards Association (ASA) for their endorsement.

We hope to get ASA approval of the new standards next year. It is expected that the new standards on the average will be about twice the values of the previous (1952) standards.

Q: With more automated plants, will these higher lighting levels be needed?

A: As industry becomes more and more automated, seeing tasks become more difficult and more vital to profitable operation. Close observations of equipment, meters, and instruments together with quick physical changes indicated will call for more and better lighting to protect and get the maximum return from the major investments in machines and the highly trained operators.

Generally speaking, investment in better lighting pays better dividends than an equal investment in almost

any other productive facility.

Q: Which light source do most of the new installations use?

A: Industry is moving rapidly into fluorescent, which now accounts for about 70 percent of the new installations. Our guess is that the potential for fluorescent runs close to 90 percent. The remaining percentage splits about equally between mercury and filament. There is no indication of a significant change in this relationship.

Q: Why the swing toward fluorescent?

A: Fluorescent produces light at lower cost: about three times as efficiently as filament and somewhat more efficiently than mercury. Then too, it has a lower brightness source — a real advantage in lighting comfort both from the direct and reflected glare. It is also well adapted to the modern higher voltage distribution systems. And its long life and excellent lumen maintenance as well as its instant starting characteristics are corollary benefits.

Q: What about lamp life for the three types of sources?

A: Basically, mercury and fluorescent lamps have long lives, 6000 to 15,000 hours, depending on lamp type and the conditions of service. Many industrial areas get particularly long life because the number of hours per start is long. Filament lamps on the other hand have a life of about 1000 hours in lamps of standard design.

Many industrial users recognize that they buy light rather than lamps and that the major cost of producing light is *power* rather than *light bulbs*. These educated customers don't want longer life lamps; they want lamps that give them light at the lowest cost. This usually indicates lamps of 1000-hour design.

Of course, where the cost of changing a lamp is very high (several dollars) or where the cost of power is very low, longer lived lamps are justified.

Q: How does number of starts affect lamp life?

A: The number of starts does not appreciably affect filament lamp life. But starts do affect mercury and fluorescent lamps: the more frequent starting the shorter the life. Published life ratings are on the basis of three hours per start for fluorescent lamps and five hours per start for mercury lamps. If starts are less frequent, lamp life is longer — up to two or more times the published values for continuous operation.

Q: Do you feel that fixture design has kept pace with the lamp design?

A: There are many good fixture designers, and we are working closely with them on several of their new designs. We often pass along new ideas to the fixture industry, and generally speaking there are excellent designs in all fixture types for all industrial areas.

Q: Do you see anything in the offing that will improve the performance of fixtures?

A: Many interesting developments are under way in this area. Some of the metalized coatings on plastic look particularly intriguing. One method uses an evaporated coating on a thin plastic film which is then sandwiched into a backing material, such as steel or aluminum.

By this technique, higher-reflectance materials, such as silver and aluminum, can be applied at low cost. Some of these materials are so durable they can be formed by pressing or bending after being bonded together.

This may be an excellent opportunity for improved fixture performance and reduced cost. This is particularly important when you consider the relatively large area required to serve as an efficient reflector for a large source like the fluorescent lamp.

Q: What improvements in fluorescent lamps do you anticipate?

A: We are working toward both increased output and increased efficiency. For example, we have recently developed what we call the *bonus phosphor*. By using only crystals of optimum size, we markedly increased the efficiency.

Crystals that are either too small or too large are rejected. As far as higher output, the Power Groove lamp is the outstanding improvement in that direction since the first introduction of the fluorescent lamp.

It has twice the output of the highest previous source, obtained by a change in lamp geometry utilizing formed glassware. This construction places the arc closer to the phosphor so that its energy can be utilized more efficiently. It also provides relatively cool areas so that the lamp will operate at optimum mercury pressure.

Q: Do you see a trend towards high-frequency operation of fluorescents?

A: A clear opportunity for that type of installation is beginning, but I don't think the trend is established yet.

Q: What are some of the challenges to engineers in the lighting field?

A: We believe the lighting industry generally has more challenge than almost any other part of the electrical industry. That may seem a little strange to you, knowing that it's a 75-year-old industry. Even so, the production of light by electric means is still the most inefficient use of electricity we know of—only 10 or 20 percent of the input wattage radiates as light. This area obviously needs great improvement — a tough assignment for engineers and scientists of the future.

After light is produced it must be controlled — with lampshades, lamp finishes, or by building the control into the lamp's envelope so that it is not affected by dirt or moisture.

All three lighting sources respond to this control. Applying them to fixtures presents a threefold problem—the architectural, appearance design, and basic engineering performance. Fixtures today are generally efficient and perform reasonably well. But often the user is not particularly happy with the overall appearance of his living or work space.

We recognize the need for improved appearance, improved performance, and reduced costs of fixtures, and installations for all areas where lighting is used so effectively today.

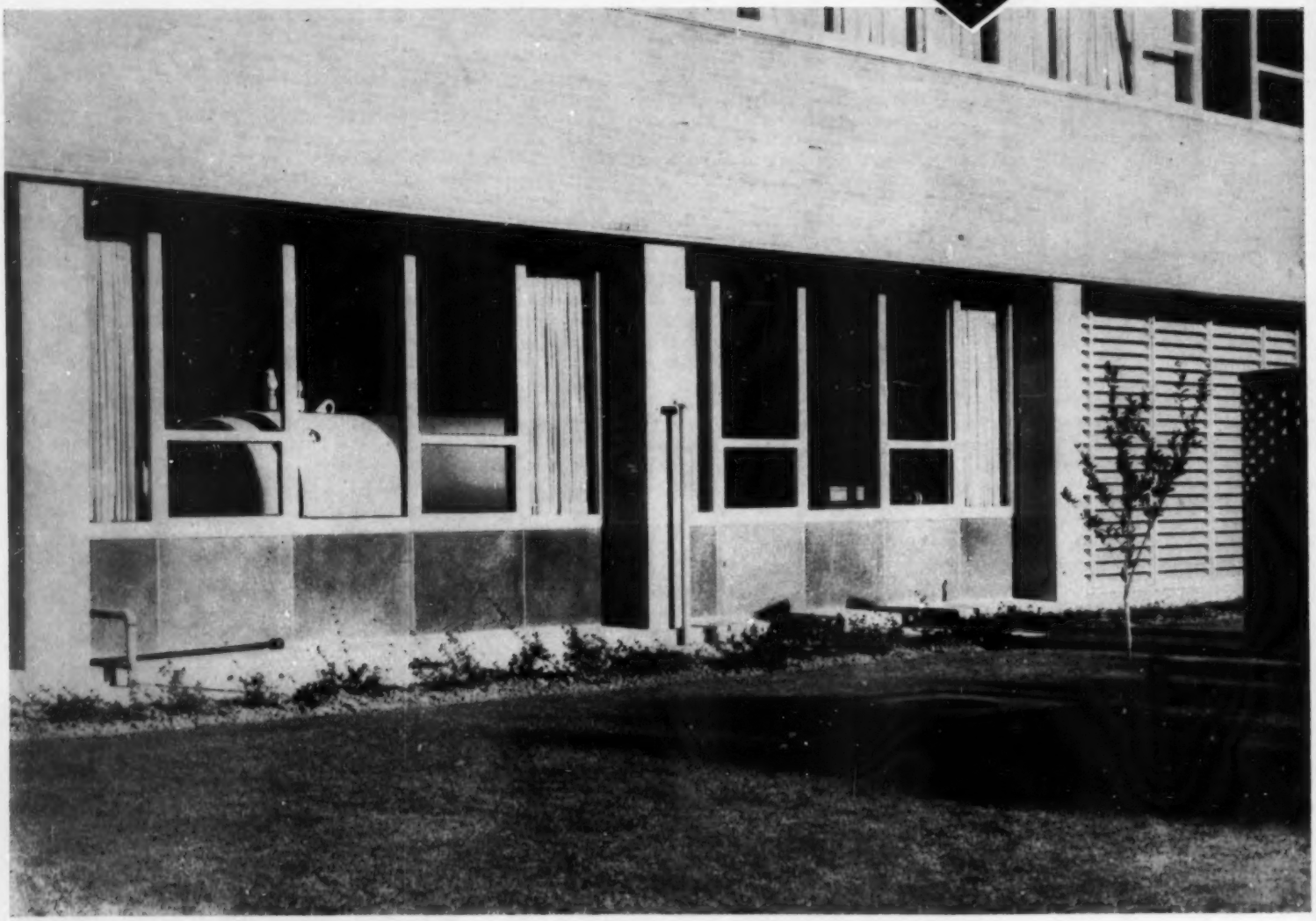
Q: What are other future trends? Where are we going? How high an output is possible with fluorescents? What are some other future innovations?

To page 33

During January of this year, General Electric Company unveiled an improved Power Groove fluorescent lamp that promises to raise industrial lighting standards to new heights. The new lamp — with staggered grooves on opposite sides — has an increased light output of 15 percent over that of the former 8-foot Power Groove tube.

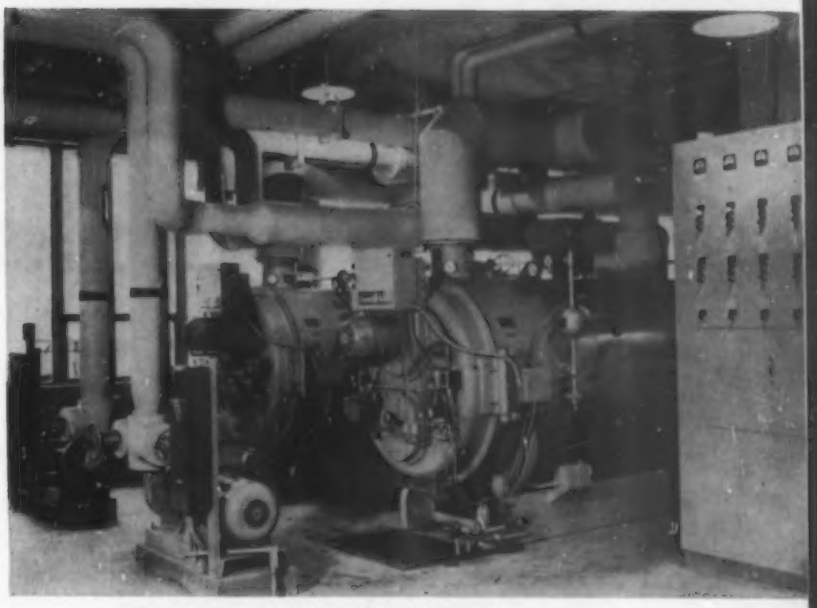
To find what else the lighting industry has up its sleeve, POWER INDUSTRY asked two men from GE's Large Lamp Department to report on the present and the future in industrial lighting. Speaking for the whole lighting industry, H. L. Weiss (right), General Manager, Large Lamp Dept., and E. A. (Red) Linsday (left), Supervisor, Industrial Lighting, answer some vital questions on the subject. Red Linsday is the chairman of the Illuminating Engineering Society committee revising industrial lighting standards.

Draperies in the boiler room



That's right. At Whirlpool Corporation's new administration center, north of St. Joseph, Mich., draperies have been hung in the boiler room, and they are cleaned only as frequently as the drapes in the executive offices

HELMUT BOHN
Chief Operating Engineer
Whirlpool Corporation
St. Joseph, Mich.



This clean, compact installation of packaged boilers promotes good housekeeping tendencies on part of operator. Excess combustion air insures complete combustion of fuel and absence of smoke and soot in stack gases

Once upon a time, not so many years ago, a power man would go to work in the morning clad in sparkling clean clothes.

But, alas, when he arrived home in the evening, his clothes, face and hands were thickly soiled with grease, oil and dirt.

Fortunately, today this man's experience is the exception rather than the rule.

Graphically illustrating this trend away from boiler rooms — which traditionally looked like the black hole of Calcutta — is the modern installation at the Whirlpool Corporation's new administrative center north of St. Joseph, Michigan.

Here, draperies have been hung in the boiler room and they are cleaned only as frequently as the drapes in the executive offices.

What makes this extreme in cleanliness possible?

Twin packaged boilers provide the answer. They have been installed in the administrative center and require only minimum supervision and adjustment.

Whirlpool's rapid expansion, consisting in part of mergers in September, 1955, with the Seeger Refrigerator Company, and the range and air-conditioning divisions of RCA, and the April, 1957, merger with Birtman Electric Company, made a central headquarters necessary.

The new, three-story, 111,610 sq ft administrative center houses the many management facilities and personnel required to efficiently manage a multi-plant operation. Construction was started August 22, 1955, and the building was completed in late 1957.

Smith, Hinchman, and Grylls, Inc., architects for the building, selected two 100-hp, oil-fired package boilers to meet heating requirements Boilers furnish hot water at 200°F for heating and hot water requirements in the cafeteria and wash rooms. The "closed" system has a 30-gallon expansion tank, located on the third floor.

Two separate systems are used to give flexibility in handling the heating load. Circulation pressure is provided by two centrifugal pumps, rated 225 gpm and 80 feet head at 1750 rpm.

Main heating system is a forced-air system through ducts to office spaces. Outside air enters through washable filters to 95,000 cfm main blower. Air is moved through inlet filters and blower to Y-duct at blower exit.

Air flow is directed through either branch of the duct to pass over 10-ft by 8-ft, finned-tube heat exchangers — one for heating and the other for cooling. Zone thermostats control modulating dampers to proportion mixture of hot and cold air to meet temperature demands. At 80°F outside air temperature, all hot water to the "hot deck" is shut off.

A hot-water baseboard system provides convection heat during periods of low heat requirement. This system shuts off when outside air temperature reaches 45°F.

Boiler operation is completely automatic. Prepurge combustion air purges the firebox for 30 seconds before ignition by gas pilot. Postpurge period, after flame has been extinguished, is also 30 seconds. Modulating damper controls inlet to centrifugal forced-air blower for combustion air.

Flame failure devices, consisting of "Fireye" programming controls, are employed. Positive fuel shutoff is accomplished upon failure of flame.

The South boiler-room wall is glassed-in and has drapes identical to those used through identical to those used throughout the building. Drapes in the boiler room match those in the executive offices.

As noted, the twin 100-hp Cleaver-Brooks boilers lend themselves perfectly to good housekeeping. The boilers were opened after a year of operation and were found to be extremely clean, making possible draperies in the boiler room.

(Model CB-134-100 packaged boilers are manufactured by Cleaver-Brooks Company, Dept. PI, 326 East Keefe Ave., Milwaukee 12, Wis.)
Circle 9665 inside back cover.

Loss of cooling water to open-hearth furnaces through a sudden loss of power would be a major mishap. To guard against such power failures and to reduce peak electrical demands, Lukens Steel Company's . . .

High-power diesel engine plays

A PI Staff Report

Two years ago, the nation's oldest independent steel maker — Lukens Steel Company — installed a 12-cylinder dual-fuel diesel engine to fill a vital, twin role at its sprawling Coatesville, Pa. plant.

The engine, a turbosupercharged unit, was to have the assignment of relieving peak electrical loads at the plant by providing crucial cooling water to the open-hearth furnaces.

But of even more importance, the engine was installed to supplant the AC pumps when the latter either require maintenance or are put out of commission by electrical storms. Here, the benefit is more pointed: by continuing the flow of water to cool the furnace doors, huge sums of money could be saved.

The engine has operated a total of 180 full days since it was delivered.

The diesel unit, with a 20,000-gallon-per-minute centrifugal pump, is installed in an inexpensive, galvanized steel building adjacent to Luken's 20-million-gallon-settling reservoir, located a mile from the main plant area.

In pumping service, it handles a water cycle beginning in Brandywine Creek, a mile downstream from the plant. A pumping station on the banks of the stream pushes the water several hundred feet into the settling reservoir.

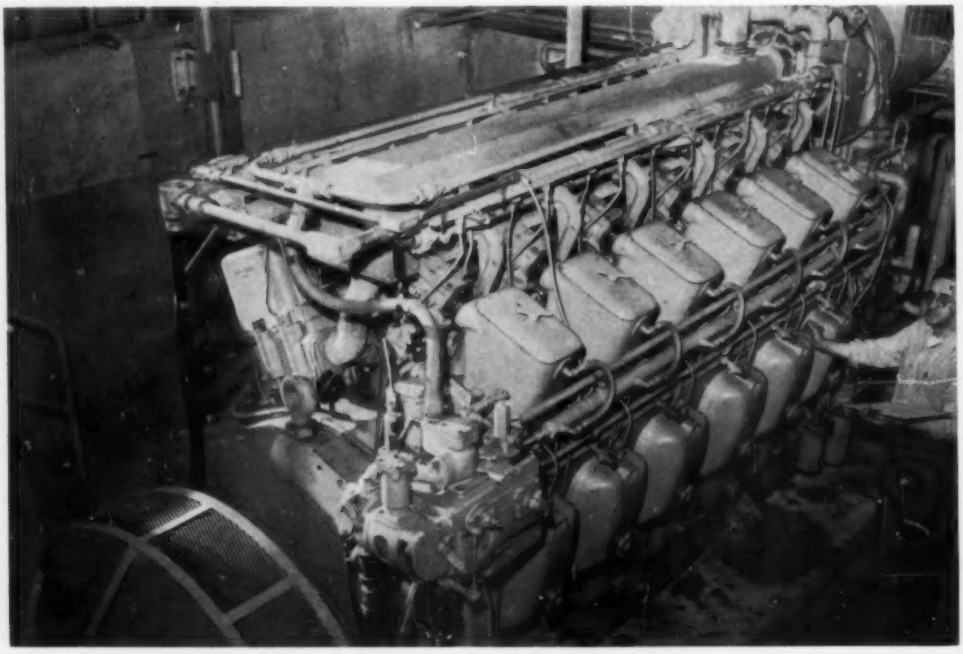
Normally, two of three AC motor-driven pumps, each with a 10,000-gpm capacity and all housed in a brick pumping station at the foot of the reservoir, handle the cooling-water supply chore. The motors that drive these pumps (one is on continual standby) are completely dependent on the local utility for their power.

With either the AC-driven pumps or the diesel on the line, water is drawn from the 24-hour supply reservoir and pumped a mile north to the plant, where it not only cools the open-hearth doors but fills all plant requirements for process water.

The cycle is completed by "dumping" the water back into Brandywine Creek, where it flows downstream to eventually enter the reservoir again. The cycle does not diminish the flow of the creek, since virtually all water removed is replaced.

But the diesel pumping set-up serves another valuable, normal role for Lukens: by supplanting the AC pumps when plant electrical consumption starts to peak, it effectively cuts into overall power usage and results in what plant engineers call "substantial annual savings" in power costs. The engine accomplishes these savings by releasing 1300 horsepower from the power load when the need arises.

There's still more to the story: only 11 months after the latest model was placed in



In more than one dramatic instance, this diesel has taken over on running pumps which transfer water to Lukens Steel Company's open-hearth furnaces. The lack of water to these furnaces would cause a major mishap

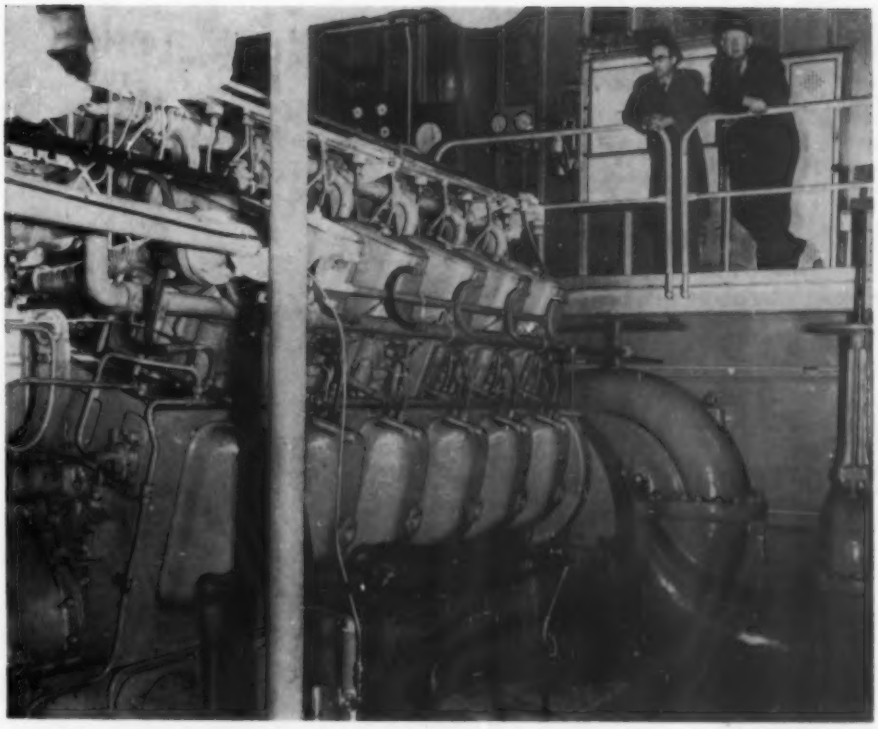
role of "safety valve"

service, a severe electrical storm knocked out the central transformer station at the 148-year-old, 700-acre plant. Every electric light was doused, and the result not only threatened to idle a 2,000-man shift but, by suddenly outting off the AC pumps, could have ruined or severely damaged the open-hearth furnaces.

The safety valve in this case was the diesel engine; engineers had established a standard rule that the engine be started and on idle every time an electrical storm began. Since the engine was immediately available when the transformers went out, it took over the task of supplying crucial water to the furnaces and avoided damage that could have run to thousands of dollars.

The "pluses" are still being realized from what began as a project to provide standby pumping service and peak-loading aid, at a total cost of under $200,000 for the engine, the auxiliary equipment selected and the building itself.

During a $33-million expansion project, the company has utilized its diesel — in the engine's primary function as a pumping unit — to permit periodic shutdowns of the AC-driven pumps while electricians revamp the plant's electrical circuitry.



The 12 cylinder, turbosupercharged diesel is combined with a 20,000 gpm centrifugal pump (right center)

Auxiliary Equipment

Installed in the "pump-house" with the engine is a collection of equipment designed to make the station fully self-sufficient.

First, in standby of the electrical motor ordinarily used to run the engine's air compressor, is a 5-hp gasoline-driven engine. Another small, 10-kw engine-driven generator set provides all initial power requirements, including that needed for electric lights in the building. And still another engine controls the main reservoir valve.

Total Operating Record

Since installation, the diesel has been operated a total of 4337 hours — or the equivalent of 180 full days out of 730.

The engine is of dual-fuel execution, burning diesel oil exclusively during startup, and then running on 93 percent natural gas blended with 7 percent diesel oil.

(Diesel engine was manufactured by Alco Products, Inc., Dept. PI, Schenectady 5, New York.)
Circle 9666 inside back cover.

CONSIDER THE HAZARD

A conversion burner or stoker in a riveted HRT boiler can cause the girth seam to deteriorate quickly. This is due to the direct impact of intense heat upon the lapped edge of the plate.

The wise thing to do before converting is to insulate the seam with a National Seam Protector. It's a precaution which will surely save a lot of trouble and expense.

Our seam protectors have saved hundreds of HRT boilers during the past 37 years. You'll find the facts interesting and valuable. Write for literature now while you're thinking of it.

NATIONAL BOILER PROTECTOR CO.
928 REIBOLD BLDG. • DAYTON 2, OHIO

Circle 9667 inside back cover.

What can new Morton LEVETROL do for you? Read all about it next month.

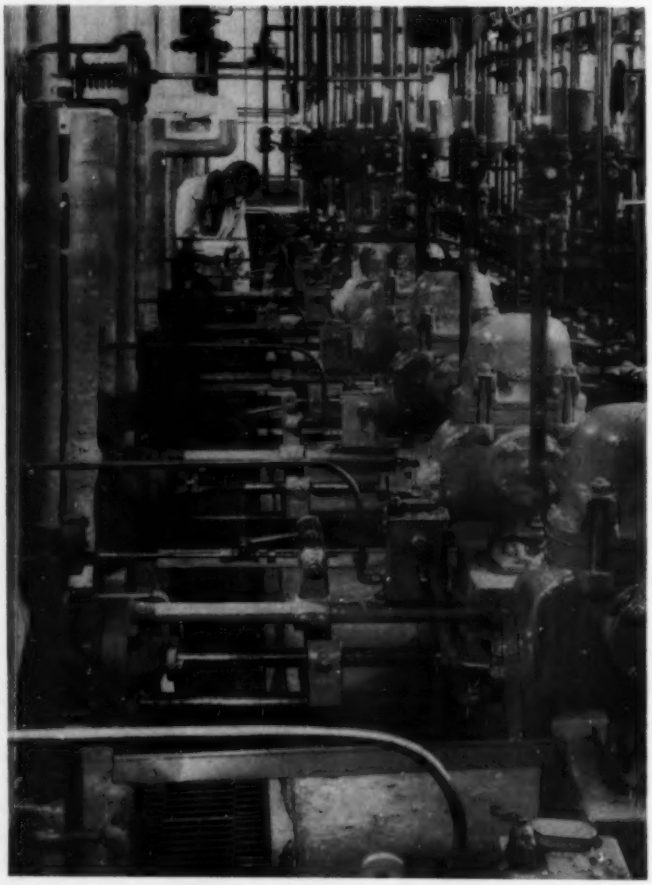
NEW SOLUTIONS

for your plant services — power services problems

Steam pump packing problem solved with lattice braided Teflon

A PI Staff Report

Teflon packing has reduced maintenance shutdowns and increased efficiency of double-acting steam pumps at Eastman Kodak



Problem: Retaining the stuffing box packing in double-acting steam pumps handling a chlorinated solvent mixture proved an expensive operation at Eastman Kodak's huge Kodak Park Works in Rochester, New York.

Swelling of a rubber-impregnated duck packing due to the chemical action of the solvent led to excessive equipment down-time, periodic production interruptions, high packing replacement costs, and loss of fluid being pumped.

In addition, the rubber packing, as a result of swelling, had a higher coefficient of friction than in a normal application. This led to increased wear of pump cylinder liners.

Solution: A trial set of lattice-braid Teflon packing was installed on a solvent pump with a normal shaft speed of 12 twelve-inch strokes per minute against a head of 100 psig. Temperature is a negligible factor in this operation and rarely exceeds that of the room housing the pump.

Packing consists of exceedingly fine fibers of Teflon woven in an interlocking lattice-like cross-section pattern to improve the strength and durability. Teflon has the necessary resistance to chemical attack and low coefficient of friction that lends itself to this type of application.

Results: Test packing substantially reduced shutdowns for packing maintenance, while markedly increasing pump efficiency by reducing slippage. The Teflon braided packing also operates at a lower coefficient of friction against the cylinder liner.

In contrast to previous packing changes at frequent intervals, the braided Teflon has become virtually a permanent packing. Kodak has adopted the packing for use on all steam pumps in this particular chlorinated solvent service.

(Lattice braid Teflon packing is a product of the Garlock Packing Co., Palmyra, New York.)

Circle 9668 inside back cover.

Insulation meets test of wide temperature differential

Because of wide temperature differential and need for enduring rapid changes from sub-zero to extreme high temperatures used in aircraft test chambers, an insulation that would not "thermal shock" or deteriorate was required.

The world's largest environmental test chamber built for the McDonnell Aircraft Corp. is capable of maintaining temperatures ranging from −100°F to 1200°F and of simulating altitude conditions up

Cellular silica insulation was installed in aircraft test chamber to withstand thermal shocks

to 150,000 ft.

A just-introduced cellular silica insulation, "Foamsil", was chosen to do the job. Consisting of 99% pure fused silica, the material cannot oxidize or absorb moisture.

In construction, the chamber consists of heavy steel plates welded to structural members. Next, two 2" layers of cellular glass insulation were installed. This was followed by two layers of 2" thick Foamsil. All joints are staggered, and the interior finish is stainless steel.

The test chamber gets its cold temperature from a 250-hp refrigeration unit. Heating units use 400 kw of power in attaining maximum operating temperature of 1200°F.

(Foamsil insulation is manufactured by Pittsburgh Corning Corporation, Dept. PI, One Gateway Center, Pittsburgh 22, Pa.)

Circle 9669 inside back cover.

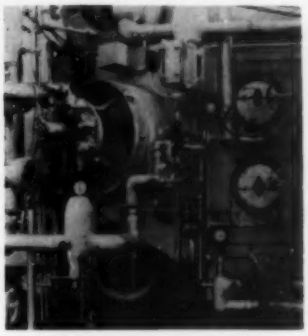
Turbine blowers save 50 electrical hp

By using exhaust steam from turbine-driven blowers in a secondary steam system, Cities Service Oil Company obtains a saving of 50 electrical horsepower on the units at its Linden, N.J., asphalt refinery.

The blowers supply adequate, reliable draft for two Foster Wheeler packaged boilers of the outdoor type. Each boiler has a continuous rating of 40,000 lb of steam per hr at 150 psig. Automatic controls adjust draft and firing rate to hold constant steam pressure.

In the set-up, the steam turbines exhaust to a 30 psig steam system which — along with steam obtained by reducing from the 150 psig mains — is fully utilized for other secondary requirements.

Compactness of the blowers permitted them to be mounted directly on the boilers by



Exhaust steam from turbine-driven draft inducers is used for secondary heating

the manufacturer.

Since they have turbine drives, the blowers represent an important source of exhaust and permit normal operation of the boilers during periods of electrical power failures.

With a maximum capacity of 13,000 cfm at 7.7" SP, blowers' sound levels have been found to be pleasing and unobjectionable.

(24AR-4D turbine blower is manufactured by L. J. Wing Mfg. Co., Dept. PI, Linden, New Jersey.)

Circle 9670 inside back cover.

BIDDLE

IMPULSE CABLE FAULT LOCATING EQUIPMENT

...for locating cable faults by impulse tracer method

...for D-C proof testing

This instrument consists of a high voltage d-c impulse transmitter with pickup coil and pointer-indicating detector. Designed primarily for locating faults on lead-covered cable installed in ducts, this equipment has applications also on aerial and buried cable, and has proved highly effective in utility and industrial service.

The transmitters require only 600 va input power at 115 v, 60 cps supply voltage and therefore can be connected to a lighting system.

MODEL 3-2 FAULT LOCATOR

Transmitter and output voltage up to 25 kv—Discharge capacitance 1.65 muf. Provided with three-range milliammeter for measuring insulation current when proof testing cable or other insulation. For use on cable up to 15 kv rating.

MODEL 4-2 FAULT LOCATOR

Transmitter output voltage up to 15 kv—Discharge capacitance 2 muf. For use on cable up to 5 kv rating.

MODEL 5-2 FAULT LOCATOR

Transmitter output voltage 5 kv—Discharge capacitance 16 muf. For use on cable up to 1 kv rating. All fault locators can be used on cable with higher voltage rating if fault conditions are favorable.

WRITE FOR BULLETIN 65-PI

B-611

JAMES G. BIDDLE CO.

• ELECTRICAL TESTING INSTRUMENTS
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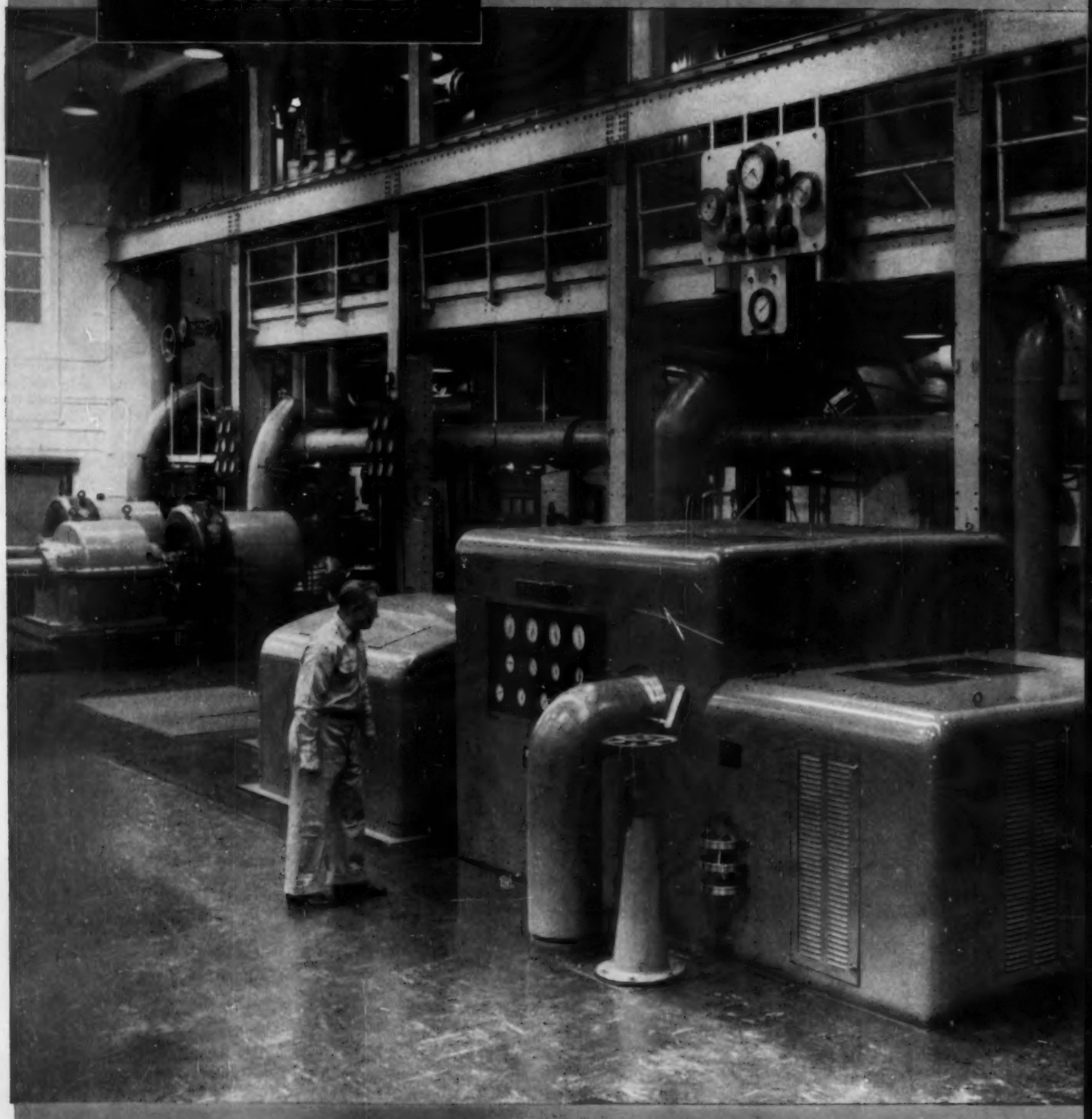
PHILADELPHIA 7, PA.

Circle 9671 inside back cover.

DE LAVAL STEAM TURBINES

for process industries



The photograph above shows a De Laval direct-connected turbine generator installation at Parke, Davis & Co., Detroit, Michigan.

This controlled extraction, controlled back-pressure unit supplies 5000 kw using process steam. Extraction is at 130 psig, exhaust is 5 psig. This new machine was added to already existing De Laval units that have been in service for 30 years. In addition, the Parke-Davis Research Laboratories in Ann Arbor, Michigan will soon be using a new 1000 kw unit.

DS-449

Parke, Davis & Co. uses DE LAVAL Steam Turbines for process and power generation

Proved economy, dependable service

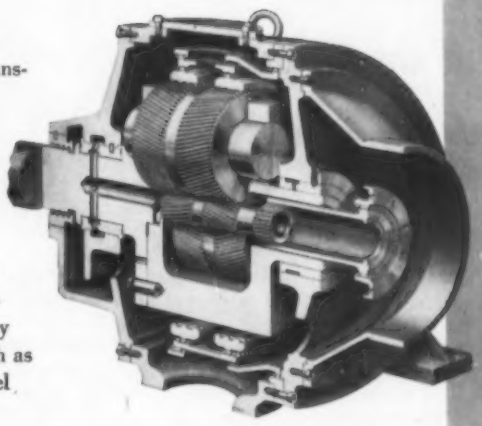
In many process industries, an important by-product is economical electric power. If appreciable quantities of process steam are used, power generation can be achieved at comparatively low cost.

De Laval, pioneer in high speed rotating machinery, has continued to maintain engineering and manufacturing leadership. If you have process application where low-cost power generation can be utilized, call on De Laval.

De Laval-Stoeckicht Planetary Gears

In many applications where high speed and high horsepower are transmitted, the De Laval-Stoeckicht planetary gear can be used to great advantage. It is also used as a speed increaser or decreaser in many industrial installations.

Among its outstanding characteristics are light weight, in-line construction and space saving. It may be used for all kinds of drives such as gas turbines, steam turbines, diesel engines, etc.



Write for Bulletin 2400

DE LAVAL *Steam Turbine Company*

857 NOTTINGHAM WAY, TRENTON 2, N. J.

For more information circle 9672 on reader service card opposite covers.

NEW DEVELOPMENTS

plant services — power services

maintenance

Field splicing of conveyor belts can be simplified with system using mechanical fasteners

Simplifies conveyor belt splicing in the field

Handy kit contains all parts

Field vulcanization of conveyor and elevator belts has long been recognized as a necessary and costly operation. A field splice using mechanical fasteners has been developed to reduce labor and time in such operations.

Available in a handy kit, the splicing system is essentially a high-tension mechanical fastener splice consisting of a V-shaped joint which forms a seal under tension. Splice is secured by means of specially designed tip and tail fasteners anchored at the extremities of two rows of bolt and plate fasteners.

Tests have shown the splice to be dependable for operating tensions up to 700 lb per inch of width rating on belts of five or more plies and thicknesses of ½" and over. It applies to belts of natural or synthetic fabrics, cord construction or any combination strength-member construction with the exception of steel wire.

Field installation can be completed quickly and easily with ordinary skill. Kit contains one set of tip fasteners, two sets of chevron fasteners and four sets of tail fasteners with necessary bolts, nuts and clips and illustrated, step-by-step instructions.

The fasteners are installed in the belt across the splice cut, at a predetermined angle. This angle permits them to rotate slightly under tension. This action causes the cut edges of the belt to close tightly and make a permanent seal — there is no leakage of material through the splice. Length of splice depends upon belt width and operating tensions.

The fasteners stabilize this rotating movement and securely anchor the tip and tail ends. To further stress-relieve the ends, the last two fasteners on both sides of tip and tail ends are installed at a different angle than the others.

Only tools required are punch and wrench for either hand or power adaptations.

(Wedlok splice is development of Manhattan Rubber Division, Raybestos-Manhattan, Inc., Dept. PI, Passaic, New Jersey.)
Circle 9673 inside back cover.

Line post insulators mount horizontally

Designed for horizontal mounting directly to side of wood poles, series of insulators provides a versatile approach to modern transmission line construction through the 88-kv range.

A pole gain, curved to fit the side of a wood pole, is incorporated into and integral with the base of the insulator.

The galvanized malleable iron gain has a large mounting surface to prevent biting into the pole and is tilted 5° to the base to counteract any imbedding that might occur.

The insulator is firmly attached to the pole by two through-bolts and cannot drop below horizontal.

Rated at 35, 45, 55, 66 and 88-kv, the insulators are available with either clamp-top or tie wire heads. The clamp-top head of galvanized malleable iron or the tie-head of high strength cast aluminum is cemented onto end of line post body.

Clamps in malleable or aluminum for the clamp-top posts are interchangeable on all units, and are available for conductor sizes 0.25" to 1.50".

The tie-heads have wide conductor grooves, and are designed to lessen corona and prevent radio and television interference.

The horizontal posts require no crossarms or braces and afford a simple hot-line maintenance.

(Horizontal posts are manufactured by Lapp Insulator Co., Inc., Dept. PI, Le Roy, N. Y.)
Circle 9674 inside back cover.

Centrifugal blowers with airfoil blades use less power

Coming in a wide range of pressures and volumes, line of centrifugal blowers varies in sizes from 440 cfm at ¼" static pressure for a single-width, single-inlet fan to more than 460,000 cfm at 16" static pressure for a double-width, double-inlet unit.

Capacities range from 440 to 460,000 cfm

The blades on these blowers have an airfoil shape. This results in greater efficiency, silent operation and reduced horsepower.

The fans meet all requirements for commercial and industrial heating and ventilating applications as well as those of a forced or induced draft nature.

(Centrifoil fans are manufactured by Joy Manufacturing Company, Dept. PI, Oliver Building, Pittsburgh, 22, Pennsylvania.)
Circle 9675 inside back cover.

Two-way control valve handles hydraulic, pneumatic jobs

Adaptable to hydraulic or pneumatic application in pressures as high as 5000 psi, two-way valve allows independently controlled flow in either or both directions.

Valve controls 5000 psig flow in either or both directions

Valve is female-threaded to dryseal specifications and is available in brass, steel, aluminum, stainless, and special alloys.

Eliminating internal gaskets, springs, or hinged parts, valve gives lower friction loss, and greater flow at all temperatures.

They may be adjusted before, during, or after installation with a common screwdriver. A straight-through ball-valve principle permits sensitive adjustments and lessens clogging.

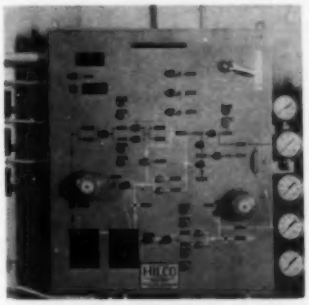
(Two-way control valve is manufactured by True-Flo Valve Co., Inc., Dept. PI, 79 Bow St., Everett, Mass.)
Circle 9676 inside back cover.

Purifies sealing, lubricating oils on vacuum pumps

Designed for full-flow purification of lubricating and sealing oil on high vacuum pumps, unit has a total oil circulating rate of 500 gph.

Capable of delivering 600 gph of vacuum pump lubricating and sealing oil, it is equipped with duplex inlet strainers to protect pumps, inlet and outlet pumps, and electrically heated vacuum vaporizer with three banks of thermostatically controlled heaters. In addition, there are duplex fullers-earth filters in the outlet line.

Other features include two sets of inlet and outlet oil pumps, centrally located graphic control panel with automatic electric controls and alarm system, single percolation tower-type fullers-earth filters which may be operated either in parallel or individually, and an outlet flow alarm system.



Close-up of control panel which operated oil reclaimer

An automatic recirculation system on the vaporizer permits only dry purified oil to be delivered to the vacuum pump charging system.

(600-X Hilco HYflow Oil Reclaimer is manufactured by The Hilliard Corp., Dept. PI, Elmira, N. Y.)
Circle 9677 inside back cover.

Mercury vapor lamp will start at −20°F

Having a double-resistor, double-electrode construction, mercury vapor lamp is doubly effective in performance and starting dependability.

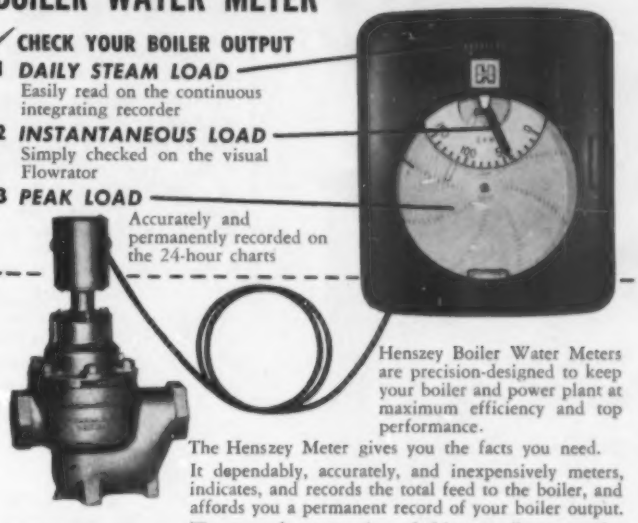
With two fully operative main and starting electrodes, the lamp will start under the worst conditions, including temperatures of 20 below zero.

It will also maintain higher lumen output throughout its 12,000-hour life.

(Double-resistor mercury vapor lamp is manufactured by Duro-Test Corporation, Dept. PI, North Bergen, N.J.)
Circle 9678 inside back cover.

HENSZEY *Remote Mounted*
BOILER WATER METER

✓ CHECK YOUR BOILER OUTPUT
1 *DAILY STEAM LOAD* — Easily read on the continuous integrating recorder
2 *INSTANTANEOUS LOAD* — Simply checked on the visual Flowrator
3 *PEAK LOAD* — Accurately and permanently recorded on the 24-hour charts



Henszey Boiler Water Meters are precision-designed to keep your boiler and power plant at maximum efficiency and top performance.

The Henszey Meter gives you the facts you need.

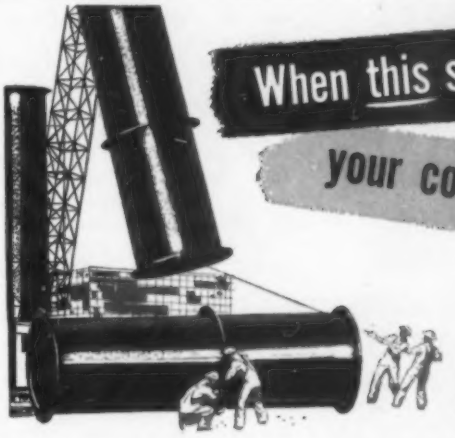
It dependably, accurately, and inexpensively meters, indicates, and records the total feed to the boiler, and affords you a permanent record of your boiler output.

The rugged construction of this versatile meter also makes it the ideal instrument to measure raw feed makeup, process returns, and boiler blowdown.

Simple, easily maintained component parts, plus flexibility of installation to meet your specific requirements. Write today for full details.

HENSZEY COMPANY • Dept. A • Watertown, Wis.

Circle 9679 inside back cover.



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your costs go down

A. O. Smith *Permaglas*® smokestacks—glass-protected inside and out . . . are virtually impervious to condensate corrosion

Write for free bulletin SS-202 illustrating how to get greater return from your stack investment

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PROCESS EQUIPMENT DIVISION
MILWAUKEE 1, WISCONSIN

Circle 9680 inside back cover.

New Morton
LEVETROL
can save you
time, money and work.
Read all about it
next month.

HOLDING POWER
Where You Need It!

With WILCOX Self-Sealing GASKETS

When the pressure is on and you need dependable holding power in your lines, you can rely on Wilcox Self-Sealing Gaskets. Over the years, they have proved their outstanding performance. The U-shaped metal outer cover is packed with a resilient filling, usually rubber or asbestos. Pressure exerted on this filling forces it into the cover, putting force against adjacent flange surfaces. Thus, pressures that tend to blow ordinary gaskets make the Wilcox tighter.

Available with covers of copper, lead, tin, aluminum, monel, stainless steel, etc. in all sizes, standard or special.

Write for Bulletin No. 569 and prices.

CHICAGO-WILCOX MFG. CO.

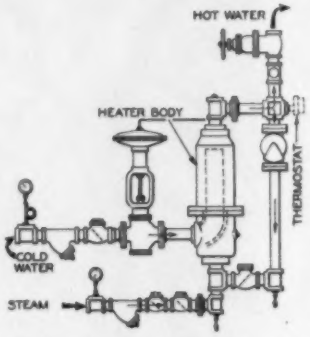
7725 South Avalon Avenue
Chicago 19, Illinois

Circle 9681 inside back cover.

NEW DEVELOPMENTS

Water heater uses low-pressure steam

In installations where source of steam is limited to low-pressure boilers because of various codes, a low-pressure steam injection unit can heat water with same advantages of temperature control and space-saving generally found with higher pressure units.



Schematic shows operation of low-pressure steam injection water heater

Actual field application has proved its ability and efficiency to make hot water for installations having boilers with pressure from 15 psig down.

Unit features space savings — it is hung on walls or fixed to posts. Neither tanks nor tubes are required, because water volume flows instantly at pre-set temperatures.

In operation, the heater provides hot water flow on a push-button basis, with absolute minimum temperature fluctuation for both continuous and start-and-stop requirements.

Water temperature changes are made in less than twenty seconds by simple resetting.

Hot water volume is adjustable from 5% up to full rated capacity. Unit is manufactured in eight different standard sizes. Capacities range from 500 gal per hr to 30,000 gal of heated water per hr. Greater volume is produced by simply joining multiples of heaters.

(Low-pressure steam injection water heater is manufactured by Pick Manufacturing Company, Dept. PI, West Bend 3, Wisconsin.)
Circle 9682 inside back cover.

Limit switch features sturdy contact

Incorporating a movable contact assembly utilizing two compressed coil springs, small heavy-duty limit switch provides quick make and break action with extended electrical and mechanical life.

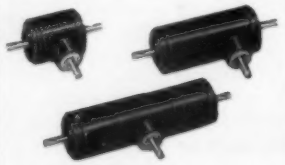
A leaf spring, carrying the contacts, assures adequate contact pressure at all times, eliminates points of zero contact-pressure and provides a non-teasing action even with an extremely slow operating action.

The contact carrier spring gives sufficient contact wipe to assure good contact on low voltage.

Wide variety of operators is available with basic switch: plunger, roller, and cabinet door types.

Completely enclosed in a semi-dust tight molded phenolic case of high physical strength and high arc-resisting capacity, the switch has an electrical rating of 600v.

(Limit switch is manufactured by Cutler-Hammer Inc., Dept. PI, 334 N. 12th St., Milwaukee 1, Wis.)
Circle 9683 inside back cover.



Miniature angle and tee drives . . .

. . . are used to transmit power at right angles in cramped space. These 1:1 ratio units may be integrally combined with miniature speed reducers or between two or more of these speed reducers, permitting takeoffs with different speed reductions. Handling up to 24 oz-in of torque and speeds to 10,000 rpm, units transmit maximum power of 0.025 hp.

(Miniature angle and T-drives are manufactured by Metron Instrument Company, Dept. PI, 432 Lincoln St., Denver 3, Colo.)
Check 9684 opposite covers.

Liquid aluminum for repair jobs

A liquid aluminum material that can be cast without heat or pressure consists of an 80% aluminum, 20% plastic.

The putty-like material becomes liquid upon the addition of a hardening agent. Two hours after the hardener is added, it becomes a tough, durable, metallic mass that is similar in appearance to aluminum or steel.

The hardened liquid-aluminum material can be drilled, tapped, and machined

Having a compression strength of 20,000 psi, it is unaffected by most oils, chemicals and solvents. The material will bond aluminum, steel, bronze, wood, and ceramic.

Non-shrinking and non-expanding, with good abrasion resistance, the hardened material can be drilled, tapped, or otherwise machined with metal-working tools.

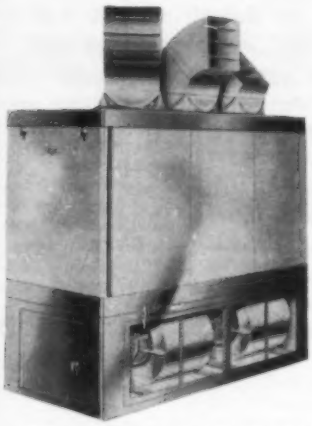
To date, it has been used to fill large and small blow holes in castings, to fill holes which have been drilled incorrectly, and to build up worn sections on cast or machined parts. It has also been used to make inexpensive but durable core boxes, patterns, matchplates, jigs, fixtures, and other industrial tools.

Available in one, four and fifteen pound units, each package is complete with exact amount of hardening agent, sufficient release agent, measuring spoons, and complete instructions.

(Devcon F-2 is manufactured by Devcon Corporation, Dept. PI, Danvers, Mass.)
Circle 9685 inside back cover.

Industrial heaters have dual fuel burner

Available in output ranges of 280,000 Btu per hr and higher, line of industrial heaters have oil, gas or combination fuel burners. For combinations, gas and oil are introduced at different points in the same firing assembly — with instant changeover by a single switch.



For combinations, gas and oil are introduced at different points in same firing assembly

Designed for either unit-heater use or for central applications, the line features quiet blower operation.

The combination air blower and individual draft blower are mounted on a single shaft and driven by a single motor.

Units are built in two separate sections, permitting either blower or furnace sections to be used individually. Blowers are capable of high air deliveries at unusually low sound levels.

Heavy-gauge stainless steel is used in the cylindrical primary heat exchanger, aluminized steel in the secondary heating surfaces. There are no internal baffles. An exclusive expansion joint permits "breathing" without straining of metal.

Units are available in four inverted and horizontal models. Air diffusion nozzles can be turned for desired air direction, or unit can be adapted for duct distribution systems.

Packaged control system features lead-sulfide scanner principle, providing all sequencing, and eliminating non-standard controls difficult to replace in the field.

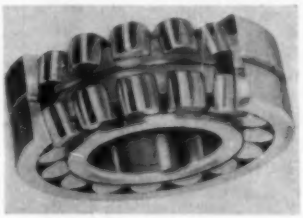
("OG" industrial heater is manufactured by Lennox Industries Inc., Dept. PI, 1701 East Euclid, Des Moines, Iowa.)

Circle 9686 inside back cover.

Spherical roller bearings have high capacity

Line of self-aligning spherical roller bearings feature maximum diameter and quantity of convex rollers for each bearing size, precision machined centrifugally cast bronze retainers, and high, heavy inner-race shoulders.

Bearings are being introduced initially in bore sizes ranging from 1.5748″ to 11.-0236″ with dynamic load ratings up to 288,000 lb. The bearing will also be available in pillow blocks in bore sizes ranging from 1-7/16″ to 10″.



Bearings have precision-machined centrifugally cast bronze retainers

Centrifugally-cast bronze retainers, accurately machined to extremely close tolerances, assure smooth, quiet bearing performance even under extreme speeds and loads. Centrifugal casting produces retainers of such density and toughness that they offer maximum bearing performances even under the most severe conditions of high eccentricity and speed.

When furnished in pillow block, a choice of bearing seals is available. Standard blocks are equipped with all-purpose, multi-labyrinth seals of rugged steel construction suitable for both grease and oil lubrication.

The multi-labyrinth seals are not affected by high temperatures and are self-aligning.

A Dacron contact seal with a tough flexible carrier, that is self-aligning and used for grease lubrication only, is also furnished. Both seals retain lubricants and exclude contaminants, are interchangeable and easily assembled into housings.

(Spherical roller bearings are manufactured by Link-Belt Company, Dept. PI, Prudential Plaza, Chicago 1, Ill.)

Circle 9687 inside back cover.

Absorbs pipe movement in any direction

Packless, corrugated-bellows expansion joints protect power and process piping systems by absorbing the following types of displacement—axial movement, lateral deflection and angular rotation, either singly, or in any combination.

Since they absorb unlimited amounts of lateral deflection without imposing any pressure thrust on piping or equipment, need for heavy structural anchors is eliminated.

Basic elements of these units include two hydraulically-formed bellows, a center section pipe and appropriate tie-rods. Units are manufactured in standard sizes from 3 to 72″ diameter and—depending upon pressures and temperatures to be encountered—are supplied with one of three different types of bellows, non-equalizing, self-equalizing or toroidal.

Designed to handle medium pressures at high temperatures or medium temperatures at high pressures, standard units are available for pressures up to 2500 psi and temperatures from −320°F to 1600°F. Special units are available for more severe conditions.

(Universal expansion joints are manufactured by Zallea Brothers, Dept. PI, 815 Locust St., Wilmington 99, Del.)

Circle 9688 inside back cover.

It's a mark of quality!
O'B-HIBIT
CORROSION INHIBITOR
You're seeing more and more of this label lately....
so if you use SULFAMIC ACID look for this label....
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Circle 9689 inside back cover.

a good team for steam

This Yarway team has scored high—over a million installed on all types of steam equipment. Stocked and sold by 270 Industrial Distributors. For free Steam Trap Book, write YARNALL-WARING CO., 100 Mermaid Ave., Philadelphia 18, Pa.

go YARWAY with confidence

Circle 9690 inside back cover.

One unit handles many pipe-hanger jobs

A universal adjustable pipe hanger ring provides a single unit which can be used in most applications in place of most other types of pipe hanger rings.

The ring consists of a metal band and a locking insert for attachment to a threaded hanger rod. The insert is self-locking through spring action as well as through the weight of the pipe supported.

One pipe hanger ring handles variety of jobs

Available in zinc or copper plate as standard, the ring comes in pipe sizes from ½" through 3½".

The band may be readily reshaped on the job if conditions require it. Other finishes or special metals are available.

The wide band makes the ring well suited to installation of plastic pipe. The ring may be safely loaded to 500 lb.

Installation involves squeezing the ring so the insert drops out, spreading and slipping over pipe and squeezing again until the insert can be reinserted. No tools are required.

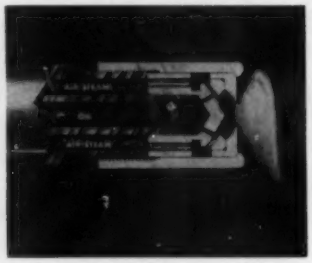
Unit is shipped in boxes of 100 as assembled unit.

(Universal adjustable pipe hanger ring is product of Auto-Grip Division, Automatic Sprinkler Corporation of America, Dept. PI, Youngstown 1, Ohio.)
Circle 9691 inside back cover.

Steam-atomizing burner developed for use on package boiler

While steam atomization has been popular for many years in larger installations, it had not been adapted to packaged firetube boilers. Now such a system has been developed for automatic package boilers.

The importance of steam atomization lies in its ability to burn heavy low-cost oils such as Bunker C and No. 6 which prove troublesome with other methods of atomization.



Steam-atomizing burner aids in complete combustion of low-cost, heavy oils

The atomizing system uses steam from boiler at approximately 40 psig to break fuel oil into a fine mist for firing. During start-up, air atomization is used until sufficient steam pressure has been generated.

Steam atomization gives clean and complete combustion of even the heaviest grades of oil. There are no moving parts in the system, and the purging flow of steam keeps the nozzle clean on shutdown.

Steam atomization can be obtained for separate burning systems.

(Steam-atomizing burner is manufactured by Orr & Sembower, Inc., Dept. PI, Box 1138, Reading, Pa.)
Circle 9692 inside back cover.

For more information on items reported in the New Developments section circle corresponding numbers on reader service card opposite covers.

Custom constructed assemblies for industrial power systems

All sizes in bronze, stainless or carbon steel, monel, inconel and low carbon nickel. Seamless spiral or parallel corrugation... Braided. All type of fittings and flanges welded, brazed or soldered. Also, interlocked hose.

write — wire — phone: RE 7-331
...for prices and catalog

COBRA METAL HOSE

5059 S. Kedzie Ave. • Chicago 32, Ill.

Circle 9693 inside back cover.

Solves wet salt storage problems. New Morton LEVETROL Read all about it next month.

NEW LITERATURE

plant services — power services maintenance

Reviews of books and industrial bulletins describing equipment, supplies, services

Heating large areas

Complete engineering data on the re-designed line of heavy-duty space heaters are subject of eight-page bulletin.

Complete construction details and specification data is given on ten models for gas, oil or gas-oil firing ranging in capacity from 400,000 to 2,000,000 Btu/hr output.

Data also includes dimensions for up-flow, down-flow and horizontal installation. Lists of control elements with a step-by-step description of the operating sequence, air throw figures for various louver arrangements and details on the exclusive burner assembly.

(Bulletin A1/2.1a is issued by the Reznor Manufacturing Co., Dept. PI, Mercer, Pa.)
Circle 9694 inside back cover.

Explains piloted pressure regulator

Pilot-operated pressure reducing valve has patented sliding gate and plate main valve. Bulletin covers valve features including integral pilot with filter screw, oversize clog-resistant passages, and ball-bearing adjusting screw with handwheel.

Short stroke with metal seats and metal diaphragms give long life with minimum maintenance.

Straight through flow gives low turbulence through main valve for accurate regulation. Tight shutoff is achieved with self-lapping seats.

Cast iron valves available in 2½" and 3" sizes for pressures to 250 psi and temperatures to 406°F.

(Bulletin JNP-1 is issued by Jordan Industrial Sales Division, OPW Corporation, Dept. PI, 6013 Wiehe Road, Cincinnati 13, Ohio.)
Circle 9695 inside back cover.

Catalogs forged steel valves, fittings

A 432-page catalog has thumb-indexed pages for easy selection of forged steel valves, fittings, flanges and unions.

Products include types and trims to meet severe fluid and gas handling services at all temperatures and pressures.

(Catalog F-10 is available on request written on company letterhead from Henry Vogt Machine Company, Dept. PI, PO Box 1918, Louisville, Kentucky.)
Circle 9696 inside back cover.

Specifies hot-water heating coils

Two-page bulletin describes and illustrates line of hot-water heating coils produced in a wide range of sizes for central station or zone air-conditioning systems.

Complete dimensional data are given on coils, available in finned heights of 12 to 36 inches in 3-inch multiples, and in finned lengths of 24 to 120 inches in 6-inch multiples.

(Bulletin HWC-200 is issued by Halstead & Mitchell, Dept. PI, Bessemer Building, Pittsburgh 22, Pa.)
Circle 9697 inside back cover.

Fluorescent lighting

The highlights of fluorescent lighting equipment lines are discussed in four-pages.

This brochure provides condensed data on commercial and industrial units, recessed troffers and ceiling systems. It describes the most popular fixtures in each line.

(Bulletin 32a/SM is issued by Smithcraft Lighting, Dept. PI, Chelsea 50, Mass.)
Circle 9698 inside back cover.

Compact motor is drip-proof

Drip-proof motor which is reduced 54% in length over standard motors is illustrated and described in four-page bulletin.

Bulletin presents full engineering information on this flange type motor of conventional radial air-gap design that is intended for use on machine tools, roof-ventilating fans and other space-cramped applications.

Cutaway drawing shows how the motor achieves its short length through formed end-coil and a one-piece housing-bearing bracket.

Motors are offered in ratings from 1 to 15 hp.

(Bulletin 2150 is issued by The Louis Allis Co., Dept. PI, 427 E. Stewart St., Milwaukee 1, Wisconsin.)
Circle 9699 inside back cover.

Portable power

Complete line of separate electric generators is described and illustrated in four-page folder.

The heavy-duty generators provide dependable electric power for draglines and shovels on construction sites, magnet cranes for industry and emergency standby.

Three types of generators are described; AC models, 1500 to 10,000 watts; battery-charging models, 1500 to 5000 watts; and tractor-drive models of 4000, 7000 and 12,000 watts.

Precise specifications of various controls to operate each type of generator are described and illustrated.

(Folder F-141 is issued by D. W. Onan & Sons, Inc., Dept. PI, Minneapolis 14, Minnesota.)
Circle 9700 inside back cover.

Determines exact hole size

For measuring size, out-of-round, taper, barrel, and bell-mouth of holes, portable, self-contained, mechanical unit is described in six-page, fold-out bulletin.

Details include large size pictures of gage and setting fixture as well as of interesting angles at which the setting fixture can be used to set the gage to dimensions of .05 inch without the use of masters, rings, or setting blocks.

(Bulletin SSC-B1 is issued by Sunnen Service Corporation, Dept. B-32, 7900 Manchester, St. Louis 17, Mo.)
Circle 9701 inside back cover.

Time controls

Eight-page catalog shows how to select time switches in special section explaining switching and timing.

Listing is given or. all available light and power time switches.

Typical wiring diagrams and explanations of "what switches what" are given, with detailed drawings and concise explanations on the use of double-throw, three-pole, or two-circuit switches.

(Catalog #159 is issued by Tork Time Controls, Inc., Dept. PI, Mt. Vernon, N. Y.)
Circle 9702 inside back cover.

What drafts can do

The what, where, how and why of draft as it affects the efficiency of the combustion process together with full details about various draft gages make up subject of 19-page bulletin.

Divided into four sections, the bulletin tells: what draft is, how draft is measured, what the draft gage tells, and how to select the draft gage to suit particular requirements.

(Bulletin No. 58-S201 is issued by The Hays Corporation, Dept. PI, Michigan City, Ind.)
Circle 9703 inside back cover.

Outstanding Accuracy
PALMER
Dial Thermometer

Check these functional features

- Direct-drive Bourdon Coil with a filled system for longer lasting accuracy.
- Stem can be placed at any desired angle and case can be rotated to most readable position.
- External calibration for zero setting.
- Unaffected by stem alignment.
- Accurate to one scale division.
- No sticking at any temperature.
- Non-corrosive case.

PALMER
THERMOMETERS, INC.
Mfrs. of Industrial Laboratory, Recording and Dial Thermometers
2515 Norwood Ave., Cincinnati 12, O.

Circle 9704 inside back cover.

NEW LITERATURE

Single-phase motors for rough atmospheres

Integral-horsepower, single-phase motors are the subject of four-page, two-color bulletin.

Available in ratings from ¾ to 20 hp, the new line includes open-protected, totally enclosed fan-cooled and explosion-proof frames.

Also outlined is the weatherizing treatment which makes the new motors suitable for use in damp, dirty or corrosive atmospheres without the need of other protection.

(Bulletin 470-B is issued by Robbins & Meyers, Inc., Dept. PI, Springfield, Ohio.)
Circle 9705 inside back cover.

Complete details on mercury switches

Revised 24-page catalog covers representative line of precision snap-action and mercury switches.

Data on high-temperature, maintained-contact, explosion-proof, high-capacity, proximity, oil-tight, environment-free and multicircuit types are included.

Photos, dimensions, electric ratings, characteristics and application information are given.

(Catalog 101d is issued by Micro Switch, Div. of Minneapolis-Honeywell Regulator Co., Dept. PI, Freeport, Ill.)
Circle 9706 inside back cover.

Transmitters described

Differential pressure transmitters are the subject of two-page brochure.

The bulletin describes application, operation, construction details, advantages and operating specifications.

(Bulletin WG-1824, Supplement A, is issued by Yarnall-Waring Co., Dept. PI, Chestnut Hill, Philadelphia 18, Pennsylvania.)
Circle 9707 inside back cover.

Explains pilot-operated reducing valve

Four-page bulletin uses several three-color cutaway drawings to explain operation of a pilot-operated pressure reducing valve.

The valve is described as being capable of pressure reductions from 600 psig initial to as low as 1 psig reduced, in one step.

(Form 5890 is issued by The C. E. Squires Company, Dept. PI, 18502 Syracuse Avenue, Cleveland 10, Ohio.)
Circle 9708 inside back cover.

Voltage regulator

Six-page bulletin describes 60-finger regulator for direct control of voltage of main fields of large alternators and generators, line load regulation, power amplification, impedance matching, and system stabilization.

Basic types and available variations, circuitry and typical applications round out explanation of unit with total finger-load rating of 720 watts.

(Bulletin #6.04 is issued by Electric Regulator Corporation, Dept. PI, Pearl St., Norwalk, Conn.)
Circle 9709 inside back cover.

Have heat exchanger cleaning problems?

Easy cleaning of heat-exchange bundles with new high-pressure jetting tool is subject of two-page bulletin.

The bundle-jetting tool consists of four principal parts: Two vertical stands, horizontal channel, and movable trolley carrying jet-head assembly.

The complete tool is assembled with only four bolts.

Examples of the prowess of the tool are given.

(Information on the high-pressure jetting tool is issued by the Dowell Co., Division of Dow Chemical Co., Dept. PI, P. O. Box 536, Tulsa, Okla.)
Circle 9710 inside back cover.

Pneumatic spreader coal stokers

Pneumatic spreader coal stokers are described in 12-page booklet. Stokers are designed to meter automatically, dry, preheat, convey and fire efficiently all sizes of coal from dust to 2-inch top size and all grades from lignite to the best bituminous.

System continually adjusts firing rate and maintains correct air-fuel ratio.

(Booklet 2530 is issued by the Iron Fireman Manufacturing Co., Dept. PI, 3170 W. 106th St., Cleveland 11, Ohio.)
Circle 9711 inside back cover.

All about mixing

The theory of mixing and a comparison of range of operations for different types of mixing equipment are discussed in bulletin.

The discussions are clearly divided into topics on rapid mixing, slow mixing (blending and flocculating), and gas dispersing mechanical equipment.

Bulletin also contains tables which assist in selection of mixer size for any application.

(Bulletin 730 is issued by Infilco Incorporated, Dept. PI, Tucson, Ariz.)
Circle 9712 inside back cover.

This **Nagle Pump** IN OPERATION 2 YEARS

—REPLACED A PUMP THAT LASTED 2 MONTHS

A leading manufacturer of household appliances* installed this Nagle 1" type H-A-W horizontal shaft pump over 2 years ago and it's still going strong. It is in the Bonderizing Dept., shown, handling phosphate slurry at the rate of 10 GPM, against a 25' head. Pump is self-priming. Simple slippage seal adjustment. Readily accessible stuffing box. Pump it replaced lasted less than two months. If you have an abusive pumping problem Nagle Pumps can cut your costs too! Send for "Pump Selector".

*Details on request.

NAGLE PUMPS

NAGLE PUMPS, INC.
1228 CENTER AVE., CHICAGO HEIGHTS, ILL.

PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

Circle 9713 inside back cover.

NEW!

Crane Formula 425-A Thread Compound prevents seizing and galling

It's the best lubricating compound you can get for high loading, high temperature installations up to 1050° F.—screwed or flanged. Prevents seizing and galling damage to pipe threads, bolts and gaskets . . . gives tight metal-to-metal contact. Joints open readily—and you can re-use materials—even after long exposure to high heat. Conforms to Military Spec. MIL-A-907. Stocked in 1- and 4-pound cans by your local Crane Branch or Crane Wholesaler.

CRANE®

World's Leading Supplier of Piping Materials
Crane Co., General Offices: 836 S. Michigan Ave., Chicago 5, Ill.

Circle 9714 inside back cover.

CUT HERE AND FILE

POWER PLANT & POWER SERVICES INDUSTRY

nomograph 20

Waste Treatment

D. S. DAVIS
Head, Dept. of Pulp and Paper Technology
University of Alabama

Although waste treatment cannot be considered an exact science, it is possible to get some idea of the expected performance of a single-stage bio-filtration plant employing a high-rate trickling filter.

This nomograph allows quick estimation of the biochemical oxygen demand (BOD) in settled filter effluent.

It is based on the equation:

$$L_e = \frac{L_o}{2R+3}$$

where,

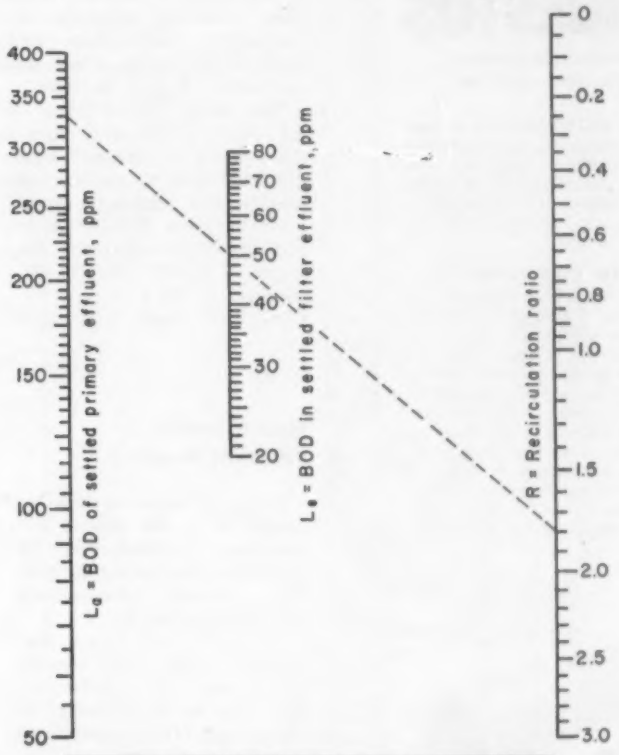
L_e = BOD of settled filter effluent, ppm
L_o = BOD of settled raw sewage, ppm
R = ratio of recirculated flow to raw sewage flow

Typical Example

To find the BOD in settled filter effluent when the recirculation ratio is 1.8 and the BOD of settled primary effluent is 330 ppm, connect 1.8 on the R scale to 330 ppm on the L_o scale. Intersection with the L_e scale indicates BOD of 50 ppm.

LITERATURE CITED:

McCabe, J., and Eckenfelder, W. W., "Biological Treatment of Sewage and Industrial Wastes," Vol 1, *Aerobic Oxidation*, p 308, Reinhold, New York (1956)



We would like to call your attention to a clarification in last month's data (pp 29 & 31) on power plant costs. To find complete cost for steam-electric plant, the cost figure derived for the steam plant must be added to that derived for the electricity generating plant.

WITHOUT HARM TO
FORM OR FUNCTION

UNIBESTOS®

...WORLD'S FINEST
PIPE INSULATION

What gives UNIBESTOS the strength and body to stand up under torturing punishment? It's the *only* pipe insulation made almost entirely of tough, long-fiber asbestos. It's *uniformly durable*—i.d. to o.d.—and this means remarkable stamina.

WORTH MORE MONEY

In passing a recent certification test at Ohio State University, a 3-section length of UNIBESTOS was boiled continuously for 72 hours, then subjected to a 24-hour period of drying. Results: no opening-up of longitudinal or butt joints; almost complete absence of fraying. It did not mush or fall away from pipe and, when dry, did not change in shape or physical characteristics. UNIBESTOS is easy to cut . . . clean to use . . . won't shrink or thermal shock!

For temperatures to 1200°F.—in single-layer thicknesses to 5" and sizes to 44" o.d.

Ask for Catalog F76-321 with exclusive "J" Factor Tables.

UNION ASBESTOS & RUBBER COMPANY
General Sales Offices, 1111 W. Perry Street, Bloomington, Illinois
Distributors in Principal Cities

Circle 9715 inside back cover.

NEW LITERATURE

Pictures 400-cps M-G sets

Line of 400-cycle power packages, incorporating unit-mounted motor, inductor-alternator and controls, is described in six-page bulletin.

Equipment is designed to provide closely regulated 400-cycle power from a 60-cycle source.

Bulletin gives construction data, operating information, dimensions and weights on output ratings from 1½ to 10 kw.

(Bulletin 307 is issued by Safety Industries Inc., Electrical Division, Dept. PI, P. O. Box 904, New Haven 4, Conn.)
Circle 9716 inside back cover.

AC magnetic starters

AC magnetic starters in NEMA sizes 0 through 4 for both reversing and non-reversing single-phase and squirrel-cage motors are described in 15-page booklet.

The detailed description of the line's components covers such items as magnet coils, overload relays, contact assembly, and enclosure types.

(Publication EN-150 is issued by Cutler-Hammer Inc., Dept. PI, 334 N. 12th St., Milwaukee 1, Wis.)
Circle 9717 inside back cover.

How to select sub-floor panels

Proper selection of sub-floor panels is made easier with four-page bulletin. Also included is information on erection, welding specifications, and flashing details.

Panels combine high strength with light weight. When used as sub-flooring, they also act as raceways for wiring and make possible the installation of future electrical outlets anywhere within a matter of minutes.

(Bulletin 2b is issued by Bowman Steel Corporation, Dept. PI, PO Box 2129, Pittsburgh, Pa.)
Circle 9718 inside back cover.

For easy selection of metal-enclosed bus

A comprehensive bulletin has been designed to aid in the selection of metal-enclosed bus for utility and industrial use.

The 20-page bulletin gives ratings and construction details of the complete line of isolated phase and nonsegregated phase bus — large-size conductor for high-voltage, high-current electrical loads — and bus auxiliary equipment.

Isolated phase bus is available in voltage ratings from 4.16 through 34.5 kv to carry up to 20,000 amperes. Nonsegregated phase bus comes in voltage ratings of from 600 volts to 13.8 kv to carry from 1200 to 5000 amperes.

Included are detailed drawings of bus sections and auxiliary equipment, electrical and physical arrangement diagrams of a typical system, and complete information on bus sizes and electrical characteristics.

(Bulletin 2604-1A is issued by I-T-E Circuit Breaker Company, Dept. PI, 1900 Hamilton St., Philadelphia, Pennsylvania.)
Circle 9719 inside back cover.

Describes enclosed limit switches

Giving complete details of nine housing groups of metal-enclosed switches for industrial uses, 20-page catalog is presented as an aid to the plant engineer and the maintenance man.

Catalog lists switches with a variety of actuator types, to fulfill almost any requirement for general-purpose, industrial enclosed switches.

Explosion-proof, maintained-contact, pre-wired, hand-operated and sealed switches are a few of the 99 different listings shown.

(Catalog 83c is issued by Micro Switch, a Division of Minneapolis-Honeywell Regulator Co., Dept. PI, Freeport, Illinois.)
Circle 9720 ...side back cover.

Plastic Steel® saved over $1000... plus days of downtime for MARRINER

A broken centrifuge at Marriner Combing Company stopped production on an important order. PLASTIC STEEL was used for on-the-spot repairs and the machine was back in operation within an hour at a cost of less than $5.00. Using conventional repair methods would involve several days and cost over $1000.

Hundreds of companies have saved time and money by repairing worn machine parts, cracked castings, leaking hydraulic systems and tanks, rebuilding worn pumps or valves, etc., with PLASTIC STEEL®.

PLASTIC STEEL® and other Devcon products are used for making jigs, fixtures, metal-forming dies, plastic and rubber molds, foundry patterns and core boxes, and other industrial tools.

PLASTIC STEEL® — as easy to use as modeling clay — hardens to steel-like strength in 2 hours . . . can be machined with regular tools. Bonds all metals, wood, glass, concrete, etc. to itself or each other. Extremely high tensile, compression, impact strength — excellent chemical resistance.

Find out how PLASTIC STEEL® and other Devcon products can save time, cut maintenance costs and speed production in your plant — write for FREE bulletin today.

Distributed nationally by leading industrial suppliers

DEVCON CORPORATION

56 ENDICOTT STREET, DANVERS. MASS.

Circle 9721 inside back cover.

Why United States Envelope Co. Selected Leffel Scotch Boilers

"Our company, as you know, has fifteen plants in each of which we have had considerable experience with boilers over the past 40 to 50 years . . . In light of this experience, and after a thorough canvass of the field, we recently purchased two of your 175 HP Leffel Scotch Type Boilers . . . Both are fully automatically controlled and fired with combination oil and gas burners . . . Our confidence in the rugged dependability, long life and freedom from expensive repairs represented by Leffel boilers is evident."

W. K. Ramsey, Engineering Manager
United States Envelope Company
Worcester, Mass.

Mr. Ramsey knows boilers — and his decision to buy Leffel boilers is based on his company's broad experience. Don't be misled by the meaningless claims and promises so common in today's boiler advertising. U. S. Envelope's decision, after a thorough survey of the field, is real evidence of the superior construction and performance of Leffel boilers.

For complete details on Leffel boilers — gas, oil or coal-fired — for requirements from 6 to 500 HP, write today for your free copy of Bulletin 236. Compare Leffel construction with anything else on the market. The facts and figures will prove that you should buy Leffel . . . and that will be the beginning of safe, carefree, profitable boiler operation for you.

THE JAMES LEFFEL & COMPANY
Dept. I
SPRINGFIELD, OHIO

Circle 9722 inside back cover.

YOU CAN EARN 20 DOLLARS

BY HAVING A NOMOGRAPH IN

POWER INDUSTRY

POWER INDUSTRY is looking for good nomographs designed to simplify calculations necessary to efficient plant and power services. If you have such a nomograph that has been helpful to you in your work — and it has not been published before — send it to:

Data Editor
POWER INDUSTRY
111 E. Delaware Place
Chicago 11, Illinois

Estimating Electrical Loads

SAMUEL B. STONE
Edited by D. S. DAVIS
Head, Dept. of Pulp and Paper Technology
University of Alabama

Frequently, it is necessary to know the kilowatt load . . . and no wattmeter is handy! However, since every installation is metered with a watt-hour meter, this meter can be used — in such cases — to find the load.

Accompanying nomograph simplifies the procedure.

Basis of the nomograph is the equation:

$$KW = 3.6 \frac{NCKh}{T}$$

where —

N = number of disc revolutions
Kh = meter constant (stamped on meter)
C = Potential transformer ratio × current transformer ratio (both also stamped on meter)
Kw = kilowatt load
T = time, seconds

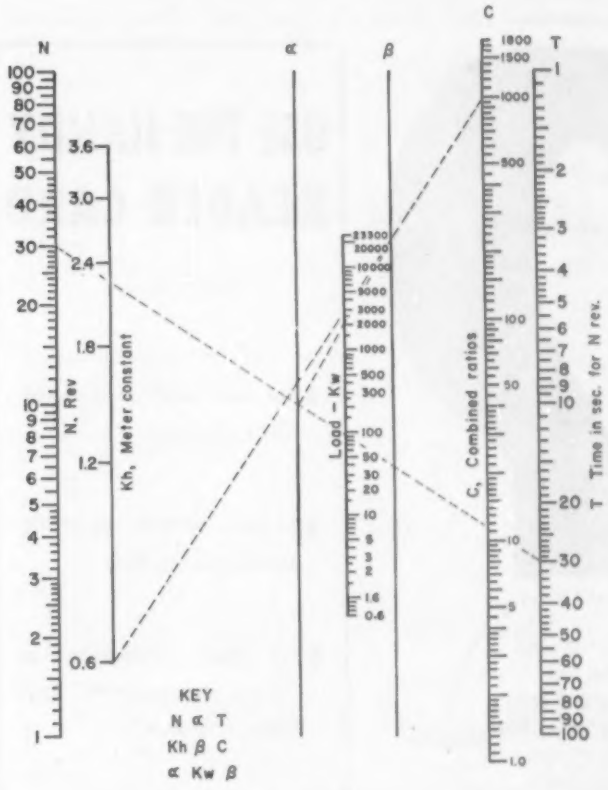
By counting number of revolutions (N) in T seconds, all variables will be known.

Typical Example

Suppose that in 30 sec, the wattmeter's disc makes 30 revolutions. If Kh equals 0.6 and C equals 1000, what is the load?

Connect N of 30 with T of 30. Note intersection on α scale. Connect Kh of 0.6 with C of 1000 and note intersection on β scale.

Now connect points on α and β scales. Read answer on Kw scale. As shown, load would be 2160 kw.



MANUFACTURED IN ACCORDANCE WITH, OR FOR USE UNDER U.S. PATENT #2,735,979

Reduce "set-up" time for relay testing to minutes with portable . . .

Multi-Amp V3DC-3PH. Multi-Amp eliminates sprawling test apparatus, confines instrumentation to a single enclosure for quick, efficient single or three-phase testing of relays. Test unit is a continuously adjustable current or voltage source. Tests may be made under single or three-phase conditions. Complete metering and timing instruments to monitor output.

Multi-Amp insures continuous power for continuous production. Saves man-hours, eliminates involved circuitry, speeds "set-up" time. Features complete portability, ease of use, safety. Standard models from 0.1 to 100 KVA for most applications; custom-engineered units as required.

Send for detailed literature.

MULTI-AMP® CORPORATION

465 LEHIGH AVENUE • UNION, NEW JERSEY

Circle 9723 inside back cover.

What can new Morton LEVETROL do for you? Read all about it next month.

USE THE HANDY READER CARD

(inside covers)

- for more information on articles in this issue
- to have POWER INDUSTRY sent to you regularly
- for more information on "New Developments" and "New Literature"

NEW LITERATURE

How copper tubing is made

Entitled "The Measure of Tubemanship", 16-page brochure describes the combination of skills and techniques necessary in the manufacture of seamless copper and copper alloy tubing.

Besides modern manufacturing facilities, booklet covers complete quality control through the various stages of tube production, creativity in developing new ideas and products, and related customer services.

("The Measure of Tubemanship" brochure is issued by Wolverine Tube, Division of Calumet & Hecla, Inc., Dept. PI, 17200 Southfield Rd., Allen Park, Mich.)
Circle 9724 inside back cover.

For more information on items reported in the New Literature section circle corresponding numbers on reader service card opposite back cover.

For winter shut-down of cooling systems

Suggestions for winter lay-up of air conditioning systems are subject of technical bulletin.

The two-page leaflet describes several procedures which, if followed before the equipment is shut down for the winter, will insure trouble-free start-up in the spring.

Subjects covered include float valves and ballcocks, flushing and cleaning, strainers and screens, refrigerant condensers, fans and louvers, painting, and closed circulating systems.

(Technical bulletin #583 is issued by Water Service Laboratories, Inc., Dept. PI, 615 W. 131st St., New York 27, New York.)
Circle 9725 inside back cover.

Steam generators dissected

Complete line of steam generators and allied equipment is the subject of 20-page catalog.

Cross section views of all major products to show design and construction are provided.

It is planned for easy reference.

(Catalog SB 60 is issued by the Erie City Iron Works, Dept. PI, Erie, Pa.)
Circle 9726 inside back cover.

Details reducing valves for 300 psig

Catalog sheet describes reducing valve for initial pressures to 300 psig with gas, oil or water.

Outlet or regulated spring ranges are 5-35, 20-60 and 40-90 psi.

Made of cast iron with bronze and steel trim, the valve is of single diaphragm single-seat construction.

Valve is also made with a reverse seating arrangement to operate as a relief valve.

(Catalog sheet on Fig. 191 reducing valve is issued by Atlas Valve Co., Dept. PI, 28 South St., Newark 5, N.J.)
Circle 9727 inside back cover.

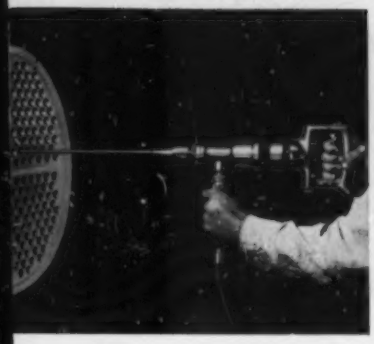
Electricity to run moving equipment

Cataloging 100-ampere steel-enclosed, trolley busway industrial electrification system, 44-page bulletin illustrates and describes track trolleys and accessories used in safe electrification of cranes hoists, moving test lines, portable and machine tools, and other moving equipment.

There are special sections on installation planning and procedure, methods of mounting and typical installations.

(Bulletin No. 75 is issued by Feedrail Corporation, Dept. PI, 125 Barclay St., New York 7, New York.)
Circle 9728 inside back cover.

AIRETOOL CLEANER



cleans condenser, H. E. tubes fast

This new, advanced design Airetool Model CC-475 Cleaner does a fast, thorough job of cleaning heat exchanger and condenser tubes. Built-in flushing system washes out debris, stops jamming. The result is faster, more complete cleaning. And the flushing agent keeps the cleaning head cool, which extends head life.

You get all these advantages, yet this sturdy, pneumatic tool weighs only 10 pounds. One man operates it easily without need for supporting rig. For full details, or plant demonstration, write today.

USES ALL TYPES OF HEADS

Every type of cleaning head can be used with Airetool Model CC-475. And Airetool makes them all.

BRANCH OFFICES:
New York, Chicago, Tulsa, Philadelphia, Houston, Baton Rouge

REPRESENTATIVES
In principal cities of U.S.A., Canada, Mexico, South America, England, Europe, Puerto Rico, Italy, Japan, Hawaii.

EUROPEAN PLANT: Vlaardingen, The Netherlands

CANADIAN PLANT: Brantford, Ontario

Circle 9729 inside back cover.

Shows wide selection of roof ventilators

Eight-page bulletin describes construction features, capacities, quietness levels and accessories of line of centrifugal roof ventilators.

Design and construction of 13 basic ventilator sizes including 111 different motor and belt-drive combinations are listed for various building environments.

Capacity table for the motor-drive combinations includes quietness rating, motor hp, fan rpm, tip speed, cfm at various static pressures and net weight.

(Bulletin 4004 is issued by Industrial Division, American-Standard, Dept. PI, Detroit 32, Michigan.)
Circle 9730 inside back cover.

How to insulate large tanks

Method of installing insulation and jacketing on large storage tanks for hot materials, at savings of 30% or more is described in four-pages.

The booklet shows how end-welded studs, on which insulation and either aluminum or steel skin is impaled, are applied directly to the tanks or on light-weight strips that are then tack-welded to the tanks.

(Tank insulation brochure is issued by Nelson Stud Welding Division, Gregory Industries, Inc., Dept. PI, Lorain, Ohio.)
Circle 9731 inside back cover.

Any size packaged steam generators

Packaged steam generators with capacities to 67,500 lb steam per hr are the subject of four-page bulletin.

The bulletin includes features, standard and optional equipment and a table of capacities and dimensions.

(Bulletin PG-58-2 is issued by the Foster Wheeler Corp., Dept. PI, 666 Fifth Ave., New York 19, N. Y.)
Circle 9732 inside back cover.

Machine-applied fireproofing

Complete technical data including specifications, fire retardant ratings, application data and job-in-process illustrations of machine-applied fireproofing are featured in four-page bulletin.

Fireproofing material is a blend of mineral fiber and inorganic binders designed for direct, machine application to structural steel and cellular floors.

(Bulletin F-10 is issued by Columbia Acoustics and Fireproofing Company, Dept. PI, Stanhope, N.J.)
Circle 9733 inside back cover.

Ni-Cd batteries for power uses

Providing detailed selection data on heavy-duty nickel-cadmium storage batteries, illustrated four-page bulletin tells how batteries are designed for starting diesel and gasoline engines, supervisory control, emergency lighting, and switch tripping.

Diagrams show ways batteries can be installed in space-conserving rack arrangements.

(Bulletin 200 is issued by NICAD Division, Gould-National Batteries, Inc., Dept. PI, Easthampton, Mass.)
Circle 9734 inside back cover.

Shows impulse testing of transformers

Four-page, two-color publication provides technical information on indications of specific forms of impulse waves, equipment used, and benefits of testing transformers by impulse. Other type tests are also listed.

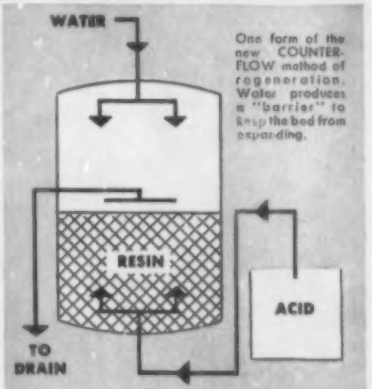
Illustrations and charts show typical examples of impulse wave shapes caused by failures.

(Brochure on impulse testing is issued by H. K. Porter Co., Inc., Delta-Star Electric Division, Dept. PI, 2437 Fulton St., Chicago 12, Ill.)
Circle 9735 inside back cover.

ILLCO-WAY ion Xchange

COUNTERFLOW*

REGENERATION OF ION-EXCHANGERS


WATER
One form of the new COUNTERFLOW method of regeneration. Water produces a "barrier" to keep the bed from expanding.
RESIN
ACID
TO DRAIN

* "COUNTERFLOW" is the trade mark of Illinois Water Treatment Company equipment utilizing a distinctly new principle of regeneration. Pat. pending.

"COUNTERFLOW" is a method whereby upward regeneration, which has long been recognized as most desirable, is successfully accomplished by establishing a "barrier" at the resin face.

LOOK AT THESE RESULTS!

- De-ionizer in a power plant. Conductivity of effluent improved from 10 micromhos to 4 micromhos after conversion to COUNTERFLOW. Cation leakage, expected at 4 ppm with downflow regeneration, actually is only 1 ppm.
- Chemical company in Middle West, 480 ppm TDS in raw water. Expected cation leakage with conventional regeneration, 9 ppm; with COUNTERFLOW, only 1.2 ppm.
- Distillery in Middle West. TDS in raw water, 575 ppm. Expected cation leakage with conventional equipment, 6 ppm; with COUNTERFLOW, is actually only 1.5 ppm.
- Western power plant, converted to COUNTERFLOW. Savings in acid reduction, $16,000.00 per year. TDS in raw water, 342 ppm. Predicted cation leakage from curves for conventional design equipment, 4 ppm; with COUNTERFLOW, actually only 1.6 ppm.

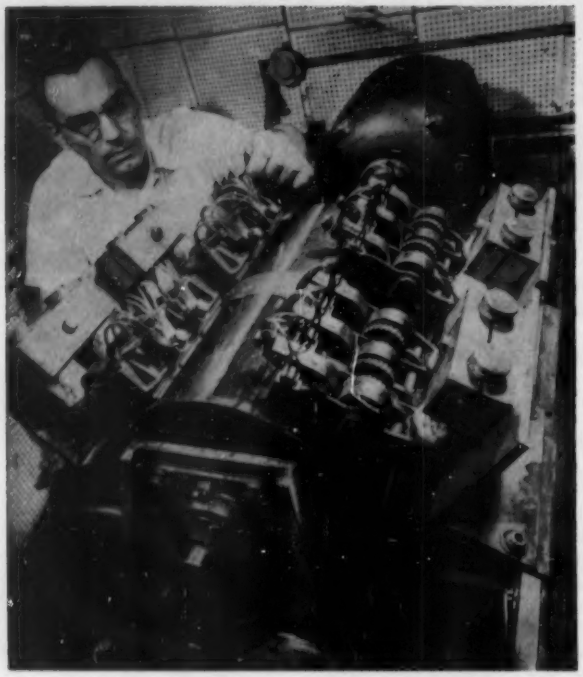
ILLCO-WAY

ILLINOIS WATER TREATMENT CO.
840 Cedar St.
Rockford, Ill.

NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Ont.

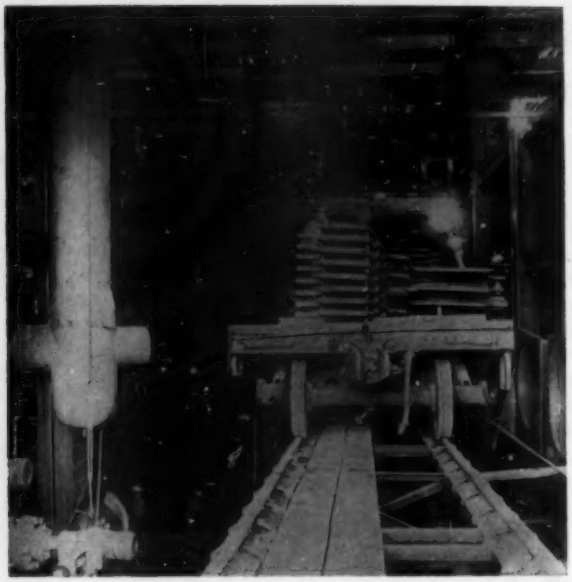
Circle 9736 inside back cover.

PHOTO NEWS



GETTING A BEATING — Nearly half a million bumps an hour on this test rig give carbon brushes a beating they'll never encounter in normal service. Rotating at 1750 rpm, the 10-inch diameter cylinder simulates a motor's commutator, except that four abrupt notches have been machined into its surfaces. During such a test at National Carbon Company, a brush that satisfactorily withstands about 20 million bumps is considered acceptable for real rough service.

SCHEDULED FOR FORT PECK DAM are two plate steel scroll case hydraulic turbines. Shown here in an Allis-Chalmers plant during shop assembly is the discharge ring, stay ring and pit liner. This assembly is 22 ft in diameter and 18 ft in overall height.



RIGHT INTO THE BOILE
comes a flatcar carryin
components such as supe
heaters, attemperators, r
heaters, economizers, flue
ducts and cyclone furnace
During the construction
the Thos. H. Allen Electr
Generating Station, Mem
phis, a spur from the l
railroad siding was r
right into the main shell
the high-pressure B & W
boiler to simplify transpo
tation and installation
these heavy components.

KRYPTON NUCLEAR BATTERY producing output potentials greater than 5 kv has a volume less than one-quarter of one cubic inch and a life of approximately 10 years. To overcome the toxicity problem, radioisotope Krypton 85 has been substituted for Strontium 90 — Krypton is not metabolized in any way by the body.

SEMI-BURIED TRANSFORMER ENCLOSURES for underground distribution systems are now available from General Electric in a package complete with transformer and two enclosed disconnects. Top of cover dome projects only 33 inches above grade.

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Aluminum Cable

From page 9

er weight. It is possible to have larger distances between pull boxes.

The other decisive point was the availability of aluminum in times of crisis and material shortages. Acme Steel engineers can remember material shortages of the past. They expect the availability of aluminum to do away with any such headaches in the future.

Aluminum cable was used for 440v, 3-phase AC and 250v DC distribution and for motor leads at these voltages in sizes larger than 350 MCM. Aluminum was also used for two 2400v, 3-phase AC underground feeders. These cables are 3-conductor, 500 MCM, 5-kv, shielded, with buna insulation and polyethylene jacket.

Breakdown on cable used is as follows: around 14,000 ft of 1600 MCM, 25,000 ft of 750 MCM, 5000 ft of 500 MCM, and over 1000 ft of 350 MCM.

In many cases, the aluminum is connected to copper bus. To overcome any difficulties that may arise from the different coefficients of expansion of the two metals, hydraulically compressed types of connectors are used. When an aluminum-bodied connector is properly compressed on the wire, a solid aluminum joint is formed.

Both wire and connector have same expansion coefficient so heating shouldn't cause any loose connections. Before connection is made, all contacts are properly cleaned.

Using the right size connector with the right compression die will eliminate any future problems.

(More information on aluminum cable may be obtained from Electrical Conductor Division, Kaiser Aluminum and Chemical Sales, Inc., Dept. PI, 919 Michigan Ave., Chicago 11, Ill.)

Circle 9737 inside back cover.

Next month —

Under a Navy contract, Foster Wheeler has designed and developed an important step forward in packaged boilers. Looking for a high-capacity coal-fired unit, they have come up with one which will produce 54,000 lb of steam per hr with an efficiency over 85 percent.

Industrial Lighting

From page 11

A: It looks as though lighting levels will increase toward something approaching full sunlight for some industrial applications. That is about 10,000 footcandles. To achieve those levels requires development of sources not yet available. Today we couldn't provide much more than 2000 or 3000 footcandles comfortably over a large area.

The Power Groove construction looks to be about as far as we can go in fluorescent design. Some other internal construction changes, such as changing the filling gas, might enable us to double or triple the present output. In 10 years or so we might be thinking, at least experimentally, in terms of Power Groove lamps of 50,000 lumens for an 8-foot lamp.

In the mercury field predictions are not easy to make, definite advancements being more difficult to see. But the one phase of mercury operation—lumen maintenance—though traditionally poor has just been improved by almost 50 percent.

The depreciation in light output over a period of time was much higher in mercury than in other sources. This new development makes it better than either fluorescent or filament in this characteristic.

In the filament area we can scarcely expect equivalent progress. After all, we have had 75 years of experience in this "hot wire in a bottle" method of producing light. Consequently we would say that improvements will be somewhat slower and less spectacular than in other fields.

Modifications in circuitry are undoubtedly going to

come along for discharge type sources — both mercury and fluorescent. The new experimental transistor oscillator converters are particularly interesting. Although limited in output and performance at the moment, they offer an excellent opportunity for improvement.

No discussion of the future would be complete without mention of electroluminescence — an intriguing method of producing light by activating a transparent plate condenser with high frequency and high voltage. This undoubtedly will receive continuing attention, and we hope it will become reasonably practical within the next 10 years.

Electroluminescence probably will have less industrial significance than in other fields. Picture a room with all wall and ceiling surfaces covered with electroluminescence. This lighting level would have to be held at about 100 footcandles to keep the brightness within tolerable limits to the room's occupants.

But 100 footcandles isn't sufficient for the adequate seeing of anything except the simplest visual task. So we expect electroluminescence without modification to be limited to office, commercial and residential areas.

Higher panel brightness can be tolerated, however, if it can be louvered or treated in some other manner.

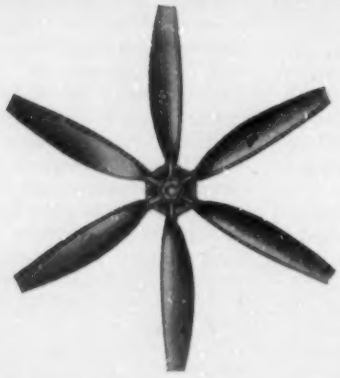
Q: Do you see any other light source on the horizon?

A: All research laboratories are continuously alert for new methods of producing light. At the moment the most promising development is in the filament field. The new T-3 Quartz lamp is already being used for wing-tip lights on jet aircraft and for other specialized applications.

It has the advantage of high wattage and ruggedness. It is uniquely appropriate for good optical control and for high voltage applications. Its efficiency is somewhat higher than present filament lamps. I expect to see it finding an important place in general lighting for industry.

A lot of HOT AIR?

Yes!... half a million cubic feet of it a minute exhausted over glass furnaces by these Hartzell fans



Adjustable pitch fans are cast of corrosion resistant aluminum alloy. Blade pitch adjustment to change air delivery requires simply loosening two bolts. Available in eleven sizes from 40" to 132" — in 3, 4 and 6 blade assemblies.

The exceptionally high air temperature over the glass furnaces in a plant located in New Jersey posed a rather unusual problem for Hartzell engineers. An enormous quantity of 160° air had to be moved very rapidly. The solution was six (two are located on opposite side of monitor) Hartzell 6 bladed 85" fans, each driven by a class "B" insulated 10 H.P. motor — each moving air at 83,000 CFM. High temperature fan belts are used to reduce fan speed to 385 RPM. Motors are all located outside the building, and in such a position that they can be serviced from the roof.

This installation is one of the more unusual ventilation problems that have come up. It points out, however, that each ventilation problem is different — each must be carefully engineered to obtain satisfactory results. Hartzell engineers take pride in having "know-how" to handle any air moving problem. And Hartzell takes equal pride in manufacturing top quality ventilating equipment — both fans and ventilators.

If you have a plant ventilating problem get in touch now with your nearby Hartzell field office. If you don't know where to find it, a note will bring the information at once.

This installation was handled by the Hartzell field office at **53** Arch Street, Camden, New Jersey; phone WOodlawn 4-5256.

here's a complete line of air moving equipment designed and built specifically for industry

Other famous Hartzell products include controllable and full feathering propellers for light aircraft, crop drying equipment and farm ventilating fans.

HARTZELL

HARTZELL PROPELLER FAN COMPANY • 53 Thomas Blvd. Piqua, Ohio
Div. of Castle Hills Corp. A Member of AMCA Engineering Offices in Principal Cities

Circle 9738 inside back cover.

THAT'S INTERESTING

Will LA sunshine beat LA smog?

If current research at UCLA pans out, Los Angeles' famous sunshine may yet triumph over its infamous smog. Work is geared to finding out what effects the light has.

In an elongated plastic doughnut — 190 running feet of 8 foot diameter tube — air is being deliberately polluted. Then researchers check to see what happens. This controlled experiment reflects what happens in the open air above the city.

Dial for light, heat

Lighting, heating and cooling have been combined in a panel by Westinghouse Electric Corporation.

The "hot-cold-light" panel responds to a set of dials which can change its temperature from a low of 55 to a high of 120°F, and vary the intensity and color range of the light source.

For the home of the future — temperature and "mood" can be set by a flick of the wrist.

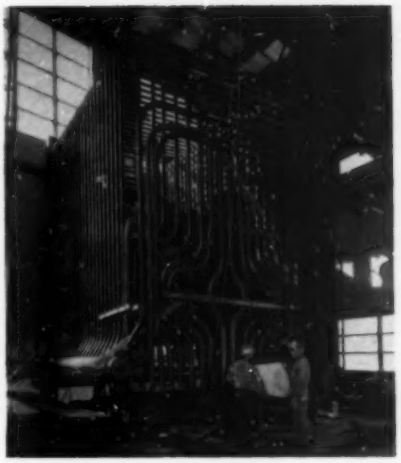
Time for safety

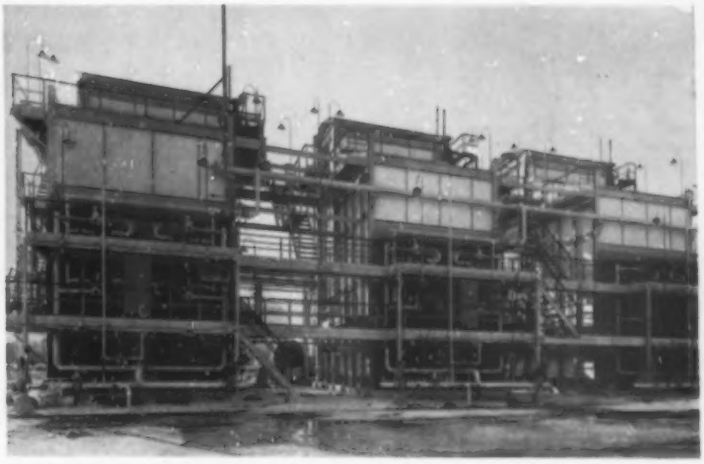
Because of the universal interest in time; clocks are a natural location for safety messages. Or so it seemed to The Electric Neon Clock Company. They have a safety message area around the top half of clocks the company has manufactured.

These messages can be read for distances up to 300 feet. The units can be used outdoors and in the most adversely lighted corridors or buildings.

(Safety message clock is manufactured by The Electric Neon Clock Co., Dept. PI, 13900 Broadway, Cleveland 25, Ohio.)

Circle 9739 inside back cover.





AT LEFT: Installing a 60,000 lbs/hr unit in a brewery

ABOVE: A battery of 125,000 lbs/hr units in a chemical plant

CUSTOM *Steam* GENERATORS

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Vogt engineering advances can save you money if you have a steam generating problem. Custom-built installations shown, are engineered to assure efficient, dependable steam generation for power, process and heating. Our engineering staff is available to give effective help in the solution of steam generating problems peculiar to a wide variety of operating conditions. Address Dept. 24A-BIP.

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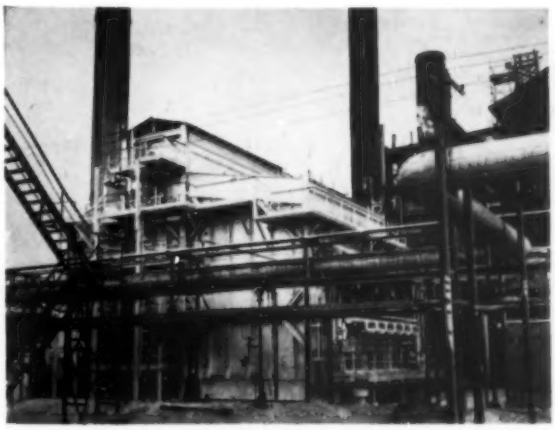
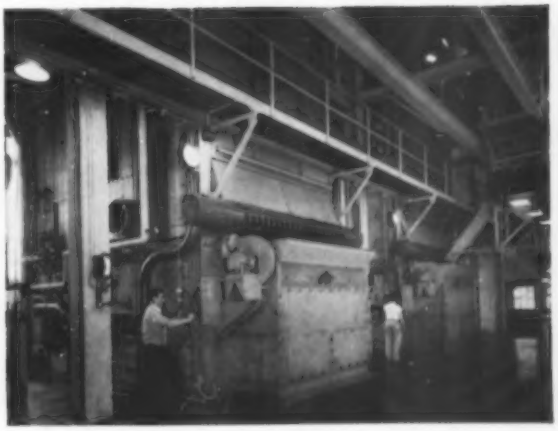


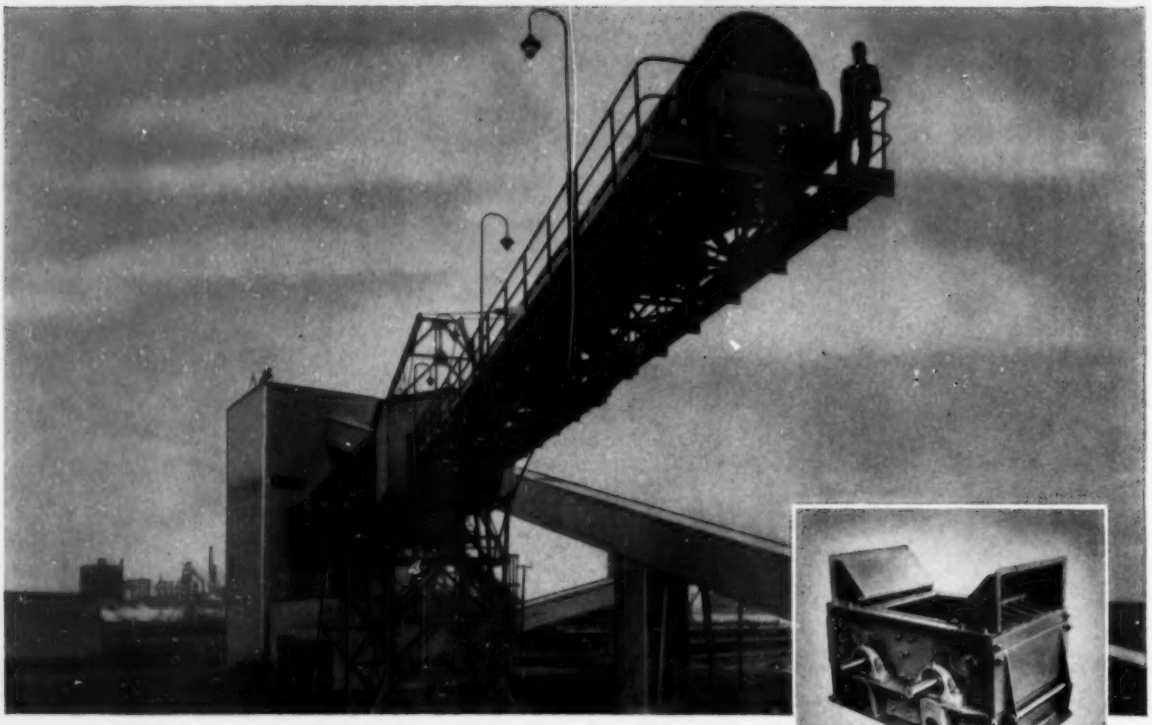
This 400,000 lbs/hr unit is installed in a leading petroleum refinery

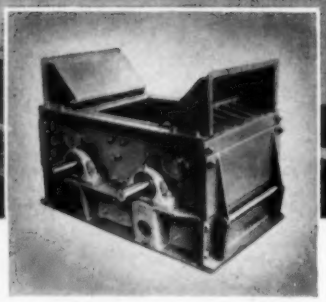


Three 40,000 lbs/hr units serve a medical center

Circle 9740 inside back cover.

STEPHENS-ADAMSON



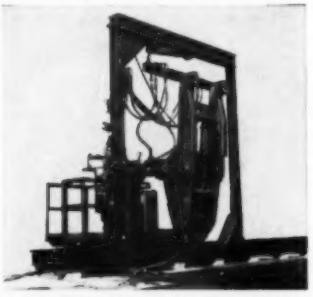


S-A RING TYPE, DOUBLE ROTOR KNITTEL CRUSHER — Crushes lumps while in suspension. Maintains full capacity with wet coal — no clogging. Greater capacity — less space required.

COAL HANDLING SYSTEMS
increase tonnage, lower costs!

When STEPHENS-ADAMSON engineers and builds a coal handling system, over a half-century of "know-how" in the design of unloading, storing, crushing, reclaiming, sampling, and distributing systems is put to use. S-A experience dates back as far as the early beginnings of electric power and includes the engineering of giant systems such as the mammoth Detroit-Edison and New York State Electric installations to a newly engineered power plant in Bombay, India. Large or small, an S-A engineered system means more kilowatts per ton and years of dependable service.

Backing up the "know-how" and experience is a quality-engineered line of components, each providing an exclusive combination of features — many of them carrying patents by S-A engineers. Put S-A engineering skill to work for you . . . write for full information today!



S-A HYDRAULICALLY POWERED CARQUAKE — Maximum efficiency in unloading hopper cars with minimum noise. One man operation. No expensive overhead structures — a completely self-contained unit.

WRITE FOR BULLETINS 858 and 658

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SEALMASTER BALL BEARING UNITS

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Circle 9741 inside back cover.

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